U. T. Hullon

PETITIONS FOR DAMAGES

FOR THE

Diversion of Sudbury River

BYIHE

CITY OF BOSTON.

BETYL

F PETITIONS, TESTIMONY AND ARGUMENTS OF COUNSEL PRESENTED BEFORE

> WILLIAM G. RUSSELL, JAMES B. FRANCIS, CHARLES A. STEVENS,

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BOSTON:

ROCKWELL AND CHURCHILL, CITY PRINTERS,
No. 39 ARCH STREET.
1876.

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PETITIONERS FOR DAMAGES

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AGAINST THE

CITY OF BOSTON.

ELIAS MERWIN,
J. J. STORROW,
E. F. HODGES,
J. G. ABBOTT,
CFC

N, G. A. SOMERBY,
V, GEO. O. SHATTUCK,
MOORFIELD STOREY,
DANIEL S. RICHARDSON,
GEO. F. RICHARDSON,

Of Counsel for Petitioners.

BENJAMIN F. BUTLER, LINUS M. CHILD,

Of Counsel for the City.

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AN ACT

FOR SUPPLYING THE CITY OF BOSTON WITH PURE WATER.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:—

SECTION 1. The City of Boston is hereby authorized, by and through the agency of three Commissioners, to be appointed in the manner hereinafter provided, to take, hold and convey, to, into and through the said city, the water of Long pond, so called, in the towns of Natick, Wayland and Framingham, and the waters which may flow into and from the same, and any other ponds and streams within the distance of four miles from said Long pond, and any water-rights connected therewith; and may also take and hold, by purchase or otherwise, any lands or real estate necessary for laying and maintaining aqueducts for conducting, discharging, disposing of, and distributing water, and for forming reservoirs; and may also take and hold any land on and around the margin of said Long pond, not exceeding five rods in width, measuring from the verge of said pond when the same shall be raised to the level of eight feet above the floor of the flume, at the outlet thereof, and on and around the said other ponds and streams so far as may be necessary for the preservation and purity of the same, for the purpose of furnishing a supply of pure water for the said City of Boston.

The City of Boston shall, within sixty days from the time they shall take any lands or ponds or streams of water, for the purposes of this act, file, in the office of the Registry of Deeds for the county where they are situate, a description of the lands, ponds, or streams of water so taken, as certain as is required in a common conveyance of lands, and a statement of the purpose for which taken; which said description and statement shall be signed by the said

mayor.

Section 2. The said city may, by and through the same agency, make and build one or more permanent aqueducts from any of the aforesaid water-sources, to, into and through the said city, and secure and maintain the same by any works suitable therefor; may connect the said water-sources with each other; may erect and maintain dams to raise and retain the waters therein; may make and maintain reservoirs within and without the said city; may make and establish such public hydrants in such places as may from time to time be deemed proper, and prescribe the purposes for which they may be used, and may change or discontinue the same; may distribute the water throughout the city, and for this purpose may lay down pipes to any house or building in said city, the owner, or owners thereof, having notice and not objecting thereto; may regulate the use of the said water within and without the said city, and establish the prices or rents to be paid therefor. And the said city

may, for the purposes aforesaid, carry and conduct any aqueducts, or other works by them to be made and constructed, over or under any water-course, or any street, turnpike-road, railroad, highway, or other way, in such manner as not to obstruct or impede travel thereon; and may enter upon, and dig up any such road, street, or way, for the purpose of laying down pipes beneath the surface thereof, and for maintaining and repairing the same; and, in general, may do any other acts and things necessary, or convenient and

proper, for the purposes of this act.

Sect. 3. Three Commissioners shall be appointed by the City Council, who shall, during their continuance in office, execute and perform, and superintend and direct the execution and performance of all the works, matters and things mentioned in the preceding sections which are not otherwise specially provided for in this act; they shall be subject to such ordinances, rules and regulations, in the execution of their said trust, as the City Council may, from time to time, ordain and establish, not inconsistent with the provisions of this act and the laws of this Commonwealth. They shall respectively hold their said offices for the term of three years next after their said appointment, unless the aqueducts and works aforesaid shall be sooner completed; but they, or either of them, after having had an opportunity to be heard in his or their defence, may be removed at any time by a concurrent vote of two-thirds of each branch of the City Council; and in case of a vacancy in the Board of Commissioners, by death, resignation or removal, such vacancy shall be filled by the appointment of another Commissioner, in manner aforesaid, who shall hold his office for the residue of the said term of three years, with all the powers, and subject to all the restrictions, aforesaid. A major part of said Commissioners shall be a quorum for the exercise of the powers, and the performance of the duties of the said office. They shall, once in every six months, and whenever required by the City Council, make and present, in writing, a particular report and statement of all their acts and proceedings, and of the condition and progress of the works aforesaid.

Sect. 4. Before the appointment of the Commissioners aforesaid, the City Council shall establish and fix the salaries or compensation to be paid to the Commissioners for their services, and the said salaries of the said Commissioners, so established and fixed as aforesaid, shall not be reduced during their continuance, re-

spectively, in said office.

Sect. 5. Whenever the said office of Commissioners shall cease, either by the expiration of the said term of three years from the original appointment, or by the completion of the aqueducts and works mentioned in the preceding sections of this act, all the rights, powers and authority given to the City of Boston by this act shall be exercised by the said city, subject to all the duties, liabilities and restrictions herein contained, in such manner and by such agents, officers and servants as the City Council shall from time to ordain, appoint and direct.

Sect. 6. The said City of Boston shall be liable to pay all damages that shall be sustained by any persons in their property by the

COCHITUATE WATER ANT:

taking of any land, water, or water-rights, or by the of any aqueducts, reservoirs, or other works for the this act.

And if the owner of any land, water, or water-rights, which shall be taken as aforesaid, or other person who shall, every in damage as aforesaid, shall not agree upon the damages to sustain therefor, he may apply by petition for the assessment of his be paid damages, at any time within three years from the taking of the said land, water, or water-rights as aforesaid, and not afterwards, to the Court of Common Pleas * in the county in which the same situate; such petition may be filed in the clerk's office of sa are Court, in vacation or in term-time, and the clerk shall thereupoid issue a summons to the City of Boston, returnable, if issued in vacation, to the then next term of the said Court, and if in termtime, returnable on such day as the said Court shall order, to appear and answer to the said petition; the said summons shall be served fourteen days at least before the return day thereof, by leaving a copy thereof, and of the said petition, certified by the officer who shall serve the same, with the Mayor or clerk of the said city; and the said Court may, upon default or hearing of the said city, appoint three judicious and disinterested freeholders of this Commonwealth who shall, after reasonable notice to the parties, assess the damages, if any, which such petitioner may have sustained as aforesaid; and the award of the said freeholders, or of the major part of them, being returned into and accepted by the said Court, shall be final, and judgment shall be rendered, and execution issued thereon, for the prevailing party, with costs, unless one of the said parties shall claim a trial by jury as hereinafter provided.

Sect. 7. If either of the parties mentioned in the preceding section shall be dissatisfied with the amount of damages awarded as therein expressed, such party may, at the term at which such award was accepted, or the next term thereafter, claim, in writing, a trial in said Court, and have a jury to hear and determine at the bar of said Court all questions of fact relating to such damages, and to assess the amount thereof; and the verdict of such jury being accepted and recorded by the said Court, shall be final and conclusive, and judgment shall be rendered and execution issued thereon; and costs shall be recovered by the said parties respectively, in the same manner as is provided by law, in regard to

proceedings relating to the laying out of highways.

Sect. 8. No application shall be made to the Court for the assessment of damages for the taking of any water-rights, until the water shall be actually withdrawn or diverted by the said city under the authority of this act; and any person or corporation whose water-rights may be thus taken and affected, may make his application aforesaid at any time within three years from the time when the waters shall be first actually withdrawn or diverted as aforesaid.†

^{*} Now the Superior Court.

[†] See sect. 2, chap. 187, 1849, p. 200, and chap. 316, 1850, p. 202.

ively.

Sect. 9. For the purpose of defraying all the costs and expenses of such landks, estates, waters and water-rights, as shall be taken, purchased or held for the purposes mentioned in this act, and of constructing all aqueducts and works necessary and proper for the accoraplishment of the said purposes, and all expenses incident thetreto, the City Council shall have authority to issue, from time the time, notes, scrip, or certificates of debt, to be denominated on the face thereof, "Boston Water Scrip," to an amount not exceeding in the whole the sum of three millions of dollars, bearing interest at a rate not exceeding the legal rate of interest in this Commonwealth; and said interest shall be payable semiarnually, and the principal shall be payable at periods not more tian forty years from the issuing of the said scrip, notes or certifiates respectively. And the said City Council may sell the same, or any part thereof, from time to time, at public or private sale, or pledge the same for money borrowed for the purposes aforesaid, on such terms and conditions as the said City Council shall judge

Sect. 10. In addition to the sum of three millions of dollars mentioned in the preceding section, the said City Council may, whenever and so far as may be necessary, issue and dispose of notes, scrip, or certificates of debt, in the manner prescribed in the preceding section, to meet all payments of interest which may accrue upon any scrip by them issued: provided, however, that no scrip shall be issued for the payment of interest as aforesaid, after the expiration of two years from the completion of said aqueducts and other works; but payment of all interest that shall accrue after that time shall be made from the net income rents, and receipts for the use of the water, if they shall be sufficient for that purpose, and, if not, then the payment of the deficiency shall be otherwise provided for by the City Council. All notes, scrip, and certificates of debt to be issued as aforesaid shall be signed by the Treasurer and Auditor, and countersigned by the Mayor of the said city, and a record of all such notes, scrip, and certificates shall be made and kept by the said Treasurer and Auditor respect-

SECT. 11. The City Council shall, from time to time, regulate the price or rents for the use of the water, with a view to the payment, from the net income, rents and receipts therefor, not only of the semi-annual interest, but ultimately of the principal also of the "Boston Water Scrip," so far as the same may be practicable and reasonable. And the said net surplus income, rents and receipts, after deducting all expenses and charges of distribution, shall be set apart as a Sinking Fund, and shall be appropriated for and towards the payment of the principal and interest of the said towards the payment of the management, control and direction of the Mayor, Treasurer and Auditor of the city, or the major part of them for the time being, who shall be trustees of the said fund, be applied solely to the use and purpose aforesaid, until the said scrip shall be fully paid and discharged. And the said trustees

^{*} See chap. 33, 1848, p. 199, and sect. 1, chap. 187, 1849, p. 200.

shall, whenever thereto required by the City Council, render a just, true and full account to the said City Council of all their receipts, payments and doings, under the provisions of this section.

Sect. 12. At any time after the expiration of two years from the completion of the works mentioned in the second section of this act, and before the reimbursement of the principal of the "Boston Water Scrip" hereinbefore mentioned, if the surplus income and receipts for the use of the water distributed unaler the provisions of this act, at the price established by the City Coluncil, after deducting all expenses and charges of distribution, shall, for any two successive years, be insufficient to pay the accruing interest on the said scrip, then the Supreme Judicial Court, on the petition of one hundred or more of the legal voters of the said city, praying that the said price may be raised and increased so fall as may be necessary for the purpose of paying, from the said surplus income and receipts, the said accruing interest, and upon due notice of the pendency of such petition given to the said city in such manner as the said Court shall order, may appoint three Commissioners, who, upon due notice to the parties interested, may raise and increase the said price, if they shall judge proper, so far as may be necessary, in their judgment, for the purpose aforesaid, and no further. And the award of said Commissioners, or the major part of them, being returned to said Court, at the then next term thereof, for the county of Suffolk, and accepted by the said Court, shall be binding and conclusive, for the term of three years next after the said acceptance, and until the price so fixed by the Commissioners shall, after the expiration of said term, be changed or altered by the City Council.

SECT. 13. If the surplus income and receipts for the use of the water distributed under the provisions of this act, at the price established by the City Council, after deducting all expenses and charges of distribution, shall, for any two successive years, be more than sufficient to pay the accruing interest on the "Boston Water Scrip," hereinbefore mentioned, then the Supreme Judicial Court, on the petition of one hundred or more of the legal voters of the said city, who may deem the said price unreasonably high, and pray for a reduction thereof, and upon due notice of the pendency of said petition given to the said city in such manner as the said Court shall order, may appoint three Commissioners, who, upon due notice to the parties interested, may, if they shall judge proper, reduce the price established by the City Council: provided, that such reduction shall not be so great that the surplus income and receipts aforesaid will, in the judgment of the said Commissioners, be thereafter insufficient for the payment of the said accruing interest. And the award of the said Commissioners, or the major part of them, being returned and accepted as mentioned in the preceding section, shall be binding and conclusive, in the same manner, and to the same extent, as therein provided in regard to awards made pursuant to the provisions of that section.

And the said Court may, at their discretion, order the costs on such petitions as are mentioned in this and the preceding section, and of the proceedings thereon, or any part thereof, to be paid

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by either of the said parties, and may enter judgment and issue

execution therefor accordingly.

Sect. 14. The occupant of any tenement shall be liable for the payment of the price or rent for the use of the water in such tenement; and the owner thereof shall be also liable if, on being notified of such use, he does not object thereto; and if any person or persons shall use any of the said water, either within or without the city, without the consent of the city, an action of trespass on the case may be maintained against him or them, by the said city, for the recovery of damages therefor: provided, however, that this act shall not be so construed as to prevent the inhabitants of Natick, Framingham, Sherburne and Wayland, from using so much of the water hereby granted as shall be necessary for extinguishing fires, and for all ordinary household purposes, under such regulations of the said City Council as may be essential for the preservation of the purity of the same.

Sect. 15. If any person or persons shall wantonly or maliciously divert the water, or any part thereof, of any of the ponds, streams or water-sources which shall be taken by the city pursuant to the provisions of this act, or shall corrupt the same, or render it impure, or destroy or injure any dam, aqueduct, pipe, conduit, hydrant, machinery, or other property held, owned or used by the said city by the authority and for the purposes of this act, every such person or persons shall forfeit and pay to the said city three times the amount of the damages that shall be assessed therefor, to be recovered by any proper action. And every such person or persons may, moreover, on indictment and conviction of either of the wanton and malicious acts aforesaid, be punished by fine, not exceeding one thousand dollars, and imprisonment not exceeding

one year.*

SECT. 16. The said City of Boston is hereby authorized to purchase and hold all the property, estates, rights and privileges of the Aqueduct Corporation incorporated by an act passed February twenty-seventh, in the year one thousand seven hundred and ninety-five, and by any convenient mode may connect the same with their

other works.

Sect. 17. The Mayor and Aldermen of the City of Boston shall notify and warn the legal voters of the said city to meet in their respective wards on such day as the said Mayor and Aldermen shall direct, not exceeding thirty days from and after the passing of this act, for the purpose of giving their written votes upon the question, whether they will accept the same; and if a majority of the votes so given upon the question aforesaid shall be in the negative, this act shall be null and void.†

SECT. 18. This act shall take effect from and after its passage.

^{*} Increased to 10 years.

[†] This act was accepted April 13th, 1846, by a vote of 4,637 yeas to 348 nays. (Records of returns of votes from the several wards, April 13th, 1846.)

COCHITUATE WATER -ACT.

House of Representatives, March 30, 1846.

Passed to be enacted.

SAMUEL H. WALLEY, JR., Speaker.

IN SENATE, March 30, 1846.

Passed to be enacted.

W. B. CALHOUN, President.

March 30, 1846. Approved.

GEORGE N. BRIGGS

AN ACT

TO AUTHORIZE THE CITY OF BOSTON TO OBTAIN AN ADDITIONAL SUPPLY OF PURE WATER.

Be it enacted, etc., as follows: -

Section 1. The City of Boston is hereby authorized, by and through the agency of the Cochituate Water Board, to take, hold, and convey to, into and through said city, all the water of Sudbury river, so called, said water to be taken at any point or points within the town of Framingham, or higher up on said river, and the water of Farm pond, so called, in said town of Framingham, and the waters which may flow into and from said river and pond and to take any water-rights in or upon said river or pond, in or

above the town of Framingham, or connected therewith.

Said city may also take and hold, by purchase or otherwise, in connection with the said sources of supply, any lands and real estate necessary for increasing or preserving the purity of the water, or for laying, building and maintaining aqueducts, water-courses, reservoirs, dams, buildings, machinery and other structures and appliances, with their accessories, for conducting, elevating, purifying, storing, discharging, disposing of and distributing water; and may also take and hold any land, excepting any in the town of Framingham heretofore taken or purchased by any railroad company, on the margin of said sources of supply, not exceeding five rods in width from the high-water line of said river, storage reservoirs or pond, so far as may be necessary in the opinion of said Cochituate Water Board, for the preservation and purity of the same, for the purpose of furnishing a supply of pure water for the City of Boston.

SECT. 2. For the purposes of this act, the said city may make and build one or more permanent aqueducts from the aforesaid water-sources to Chestnut Hill reservoir, so called, or to any other reservoir owned by said city, and secure and maintain the same by

any works stitable therefor; may connect the said water-sources with Lake Cochituate; may erect and maintain dams, or may increase the neight of, and strengthen and maintain existing dams to raise the water above the same, or to form storage reservoirs; may make and maintain reservoirs within and without said city; may erect and maintain buildings and machinery for elevating the water, and lay down pipes for conducting the same; may build and maintain filters, or other means of purifying the water. And the city may, for the purposes aforesaid, carry and conduct any aqueduct, or other work, by it to be made and constructed, under or over any water-course, or any street, turnpike road, railroad, highway or other way, in such manner as not to unnecessarily obstruct for impede travel thereon; and may enter upon and dig up any such road, street or way, for the purpose of laying down pipes beneath the surface thereof, and for maintaining and repairing the same; and, in general, may do any other acts and things necessary or convenient and proper for the purposes of this act.

Said City of Boston, in entering upon and digging up any such road, street or way of public travel, shall be subject to such reasonable regulations as shall be made by the selectmen of the towns wherein such work shall be performed, for the protection of their

rights of drainage and sewerage therein.

Sect. 3. The City of Boston is hereby further authorized, by and through the agency of said Cochituate Water Board, if said Board shall deem expedient, to store and distribute water for maintaining and equalizing the flow of water in the river selected by said city as its source of supply, or in the rivers into which said river may discharge; and for this purpose said city may take and hold such land and real estate as may be necessary for building and maintaining dams, reservoirs or other structures and appliances for storing and discharging water. And the said city may, through the same agency, make and build such dams, reservoirs and other structures and appliances, at any point or points upon the said Sudbury river, and upon any and all streams flowing into the same.

SECT. 4. Nothing contained in this act shall be so construed as to authorize the City of Boston to reduce the water in Sudbury river below a sufficient height to maintain at all times a running stream therein, which shall flow at least one and one-half million gallons a day for each and every day in the year, or to draw from Farm pond or Sudbury river into Lake Cochituate when the water runs over the dam at Lake Cochituate, or to prevent the inhabitants of the towns of Framingham, Ashland, Southborough, Hudson and Westborough from taking from the Sudbury or Assabet rivers or Farm pond so much of the water hereby granted as shall be necessary for extinguishing fires, and for all ordinary domestic and household purposes, and for the generation of steam, or from cutting and carrying away ice from said pond; or as to prevent the Boston and Albany Railroad Company, or the Mansfield and Framingham Railroad Company, or the Boston, Clinton and Fitchburg Railroad Company from taking water from Farm pond, for use in locomotive or other engines, or for other railroad purposes,

under such regulations of the City Council of the City of Boston as may be essential for the preservation of the purity of the same.

SECT. 5. The City of Boston shall be liable to pay all damages that shall be sustained by any persons in their property, by the taking of or injury to any land, real estate, water or water-rights, or by the flowage of the lands of any persons, or by the interference with, or injury to any use or enjoyment of the water of said river to which any person, at the time of such taking, is legally entitled, or by any other doings under this act; and in regard to such taking, injury, interference and flowage, and the ascertainment and payment of all such damages, the said City of Boston, and all persons claiming damages, shall have all the rights, immulities and regulations which are provided in the one hundred and sixty-seventh chapter of the acts of the year eighteen hundred and forty-six, and the three hundred and sixteenth chapter of the year eighteen hundred and fifty.

Sect. 6. Whenever the City of Boston shall dig up any street or way, as aforesaid, it shall restore the same in as good order and condition as the same shall be in when such digging commenced; and the City of Boston shall at all times indemnify and save harmless the several towns within which such street or way may be, against all damages which may be recovered against them respectively, and shall reimburse to them all expenses which they shall incur by reason of any defect or want of repair in any street or way caused by the construction of any of said works, or laying of said pipes, or by the maintaining or repairing the same: provided, that said city shall have due and reasonable notice of all claims for such damages or injury, and opportunity to make a legal de-

fence thereto.

SECT. 7. If any person or persons shall wantonly or maliciously divert the water, or any part thereof, of any of the rivers, ponds, streams or water-sources, which shall be taken by the city, pursuant to the provisions of this act, or shall corrupt the same, or render it impure, or destroy or injure any dam, aqueduct, pipe, conduit, hydrant, machinery, or other property held, owned or used by the said city, by the authority and for the purposes of this act, every such person or persons shall forfeit and pay to the said city three times the amount of the damages that shall be assessed therefor, to be recovered by any proper action. And every such person or persons may, moreover, on indictment and conviction of either of the wanton and malicious acts aforesaid, be punished by fine not exceeding one thousand dollars, and imprisonment not exceeding one year, or by confinement to hard labor in the State Prison for a term not exceeding ten years.

Sect. 8. The City of Boston is authorized, if said city shall deem it expedient so to do, to supply the towns of Framingham, Newton, West Roxbury, Brighton and Brookline, or either of them, with water, in such quantities, under such conditions, and upon such terms as may be agreed upon between said city and said towns, or either of them; and such towns shall respectively have power to distribute the water so supplied among the inhabitants of

said towns.

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SECT. 9. The Commonwealth may take and convey water from said Sudbury river, or any of the reservoirs to be constructed by said city, to and for the use of the State Normal School buildings, in said town of Framingham.

Sect. 10. This act shall take effect upon its passage.

House of Representatives, April 6, 1872.

Passed to be enacted.

JOHN E. SANFORD, Speaker.

In Senate, April 6, 1872.

Passed to be enacted.

HORACE H. COOLIDGE, President.

April 8, 1872.

Approved.

W. B. WASHBURN.

In the matter of the taking of the water of Sudbury River and its tributaries by the City of Boston.

Hearing before William G. Russell, James B. Francis and Charles A. Stevens, Commissioners appointed by the Superior Court for Middlesex County to assess damages.

Boston, Monday, Sept. 11th, 1876, 11 A. M.

THE ESSEX COMPANY, PETITIONERS FOR ASSESSMENT OF DAMAGES,

vs.

THE CITY OF BOSTON.

OPENING ARGUMENT FOR PETITIONERS BY J. J. STORROW, Esq.

Mr. Chairman and Gentlemen: I will first read the petition:—

The petitioners respectfully represent as follows: They are a corporation created and existing under the laws of Massachusetts; they were incorporated by chapter 163 of the acts of the year 1845, approved March 20, 1845; said charter was amended by chapter 119 of the acts of the year 1846, approved March 18, 1846, and by chapter 295 of the acts of the year 1848, approved May 9, 1848, said corporation was duly organized under said first-mentioned act, and said amendments were duly accepted and acted upon as required by law, and ever since the respective dates of said acts the said corporation has been entitled to and has actually exercised and enjoyed the rights conferred by said charter and amendments.

They afterwards acquired by purchase and in fee a large amount of land in Methuen and in Andover, in Essex County; and among other lands they so acquired by grant from the owners thereof and became seized in fee simple of the following parcels, which are within the present limits of the city of Lawrence, in Essex County, on the north side of the Merrimack river, viz: all the land bounded

south by the Merrimack river, east by the Spicket river, north by the old road leading from Haverhill to Lowell, now known as Haverhill street, west by the old road leading from said Lowell road to the ferry over the Merrimack, commonly known as Bodwell or Tower Hill Ferry, about three-fourths of a mile above their dam, excepting two small parcels not touching the river, containing about six acres each and belonging to Fairfield, White and Bayley, respectively, and containing about six hundred acres more or less.

On the south side of the Merrimack river all the land bounded on the north by the said river, on the east and southeast by the Shawshine river, from its mouth to the point where the river road and the road hereinafter mentioned diverge, southeast and south by the road leading from said point on the Shawshine river to Lowell by the John Poor tavern, west by land of Theodore Barnard, about three-fourths of a mile above the bridge and dam and a little above said Bodwell's Ferry.

They have also acquired, paid for and own the right to flow all the lands above their dam and on both sides of the river which are flowed by maintaining their dam at such height as it now is and as they are entitled to maintain the same at under their charter.

The Essex Company have sold and conveyed portions of said real estate, but now own in fee portions of the same, and among

other parcels own the following: —

On the north side of the Merrimack river, their dam and the abutments and wing-walls thereof and land under and adjoining the same; their canal, canal-gates, gate-houses, locks, inlets and outlets thereof, and the walls and margins of the same, and the land under the same; a parcel bounded east by Broadway and the railroad, and on all other sides by the river, mill-pond and canal, being a parcel upon which the north end of their dam abuts; also all the shores and margins of the river from thence to the western limit of their said original purchase. Another parcel, suitable for a mill-site, bounded southerly by the Merrimack river, east by the Spicket river, north by their main canal, west by William C. Carter's

mill-site, containing about five acres.

On the south side of said Merrimack river their dam, with the abutments and wing-walls thereof, their canal, locks, gates, gatehouses, walls and weirs, with the land under and adjoining the same and the margins thereof; a parcel bounded east by Broadway, south by Rowe street and Shattuck street, and north and west by the river, being the parcel upon which the south end of their dam abuts; also all the margin and shores of the Merrimack river, from thence westwardly to the extreme western limit of their said original purchase; also about three hundred acres near to the above parcel, and bounded on the east by said Broadway; also the following land, suitable and intended for mill-sites, for the use of the water and water-power furnished by said Merrimack river and dam, viz.: All the land bounded south by Merrimack street, formerly known as the old river road, to North Andover, east and southeast by Shawshine river, north by the Merrimack river, west by the Essex Company's Union mill-site, excepting a parcel containing

about one hundred thousand square feet, heretofore sold to the Lawrence Gas Company, next east of the new bridge over the Merrimack river, being a strip about a mile long, and upwards of four hundred feet wide, containing about fifty-five acres, more or less; also the said Union mill-site, about three hundred feet square, between said parcel and the mill-site of Henry Arnold, and now improved by said Essex Company by a mill, the power of which is furnished by water from said canal; also another mill-site next adjoining easterly the railroad bridge across the Merrimack river about one hundred and twenty feet front on the river and canal, and about three hundred feet wide.

And thereafter they constructed a dam across said Merrimack river at Bodwell's Falls, reaching from said parcel of land which they owned on the south side of said river to the said parcel which they owned on the north side thereof; and thereby they created from the water flowing in said river a water-power to use, to sell, and to lease to other persons and corporations for manufacturing and mechanical purposes, and for the uses mentioned in their And for the purposes aforesaid as well as for the other purposes named in their said charter, they have constructed canals on each side of said river entirely through their own lands purchased by them as aforesaid, whereby the water raised by said dam is conducted to various portions of said lands used and intended to be used as mill-sites. The said dam and the said canal on the north side of said river were constructed and completed before the year 1852, and have been continually maintained ever since; and the said canal on the south side of said river was constructed in the year 1867, and has been since continually maintained; and said dam, canals, and the locks connected therewith, always have been, and now are, the property of said In said constructions they have expended Essex Company. upwards of six hundred thousand dollars, and they have also expended in New Hampshire more than one hundred thousand dollars in improving the power of said Merrimack river under and according to the first section of said chapter 119 of the acts of the year 1846.

They have sold and leased to various persons and corporations portions of their said land to be used by the latter as mill-sites, and for the erection of dwelling-houses for operatives and for other purposes, and have granted to the purchasers of said millsites, for valuable considerations, the right to draw from the canal of this corporation nearest thereto, and through the land granted, during each second of time in not more than sixteen hours per day, a definite number of cubic feet of water; but the total amount so granted is much less than the amount of water which flows in the Merrimack river above the entrance of the Concord river, and all the rest of the water-power created as aforesaid, is absolutely owned by said Essex Company. Said Essex Company also owns, at said Lawrence, more than five hundred acres of land, and as part of it, owns land suitable for and intended to be used as mill-sites, amply sufficient for the convenient and profitable use of all the water flowing to their dam, and which would

flow to it except for the obstructions and takings by the City of Boston hereinafter mentioned.

And so the Essex Company say that they are entitled to have the water of the Merrimack river, at Lawrence, flow to their dam, and through their canals without the obstruction, taking and hindrance hereinafter mentioned, in order that they may freely use, sell, or lease to others to be used, the water-power so by them created as aforesaid; and that the said water-power, and that the said dam, and that the said canals, and that the said mill-sites and other land owned by them at Lawrence are their property, to be by them used or leased or sold as they may see fit, and that a large part of the value thereof, and of each part thereof, depends upon the amount of water flowing in said river, and which comes to their said dam.

They have freely, exclusively, and adversely, to all persons, by themselves, their grantees and lessees as aforesaid, so enjoyed all the water of said river naturally there flowing without let or hindrance of any person whatever for more than twenty consecutive years prior to the taking and disturbance hereinafter mentioned.

Farm pond is a tributary of the Sudbury river, and the Sudbury river is a tributary of the Concord river, and the Concord river flows into the Merrimack river above Deer Jump Falls and above said dam of your petitioners, so that all the water of said Farm pond and said Sudbury river, before the acts of the City of Boston hereinafter complained of, did flow, and, but for said acts and obstructions still would flow, in and form part of said Merrimack river, and come to the dam of the petitioners there to be

enjoyed by them as aforesaid.

On or about the twenty-first day of January, A.D. 1875, and within three years last past, the City of Boston, by and through the agency of the Cochituate Water Board, acting under and by virtue of chapter 177 of the acts of the year 1872, approved April 8, 1872, did actually withdraw and divert, and did take for the sole use and benefit of the said City of Boston, all the water of Sudbury river so called, at and above the dam built by the City of Boston in 1872, five hundred feet, more or less, below the crossing of the said Sudbury river by the Boston, Clinton and Fitchburg railroad in the town of Framingham, in the County of Middlesex, and near the brook which is the outlet from Farm pond into said river, and all the water in the said dam to the source or sources of said river; also all the water in Farm pond so called, in said Town of Framingham, and all the water in the brook connecting Farm pond with Sudbury river; also all the water in all streams, brooks, and rivulets or water-courses of any kind, whether natural or artificial, that may flow into or from said Farm pond, and into or from said Sudbury river, at any point or points above said dam, as more fully appears by the record of said taking, dated January 21, 1875, and recorded with Middlesex Deeds, Southern District, March 17, 1875, in Book 27, folio 45, to which reference is hereby made.

And by said taking, and by said dam, and by water-courses and

channels made by said city, the water coming, and which naturally would come, to the place where said dam was erected, has been diverted from its natural course, and cannot come, and will not hereafter come, in its natural flow to the dam of your petitioners at Lawrence afore-described, and has been wholly withdrawn and diverted therefrom.

· And in and by the premises your petitioners have been greatly damaged in their property by the said taking of and injury to their land, real estate, water and water-rights, and by said interference with, and injury to, the use and enjoyment of the water of said river, to which the petitioners at the time of said taking were legally entitled. And the petitioners and the said city have not agreed upon the damages to be paid therefor, and said city have not offered to pay to the petitioners any sum whatever as and for such

damages.

Whereupon the said Essex Company petition and pray this Honorable Court for the assessment of their said damages and all other damages they have suffered and are entitled to in the premises, that due notice and summons may issue hereon; that thereafter this Honorable Court, upon hearing, or default of said city, will appoint three judicious and disinterested freeholders of this Commonwealth, who shall assess said damages, according to law. And that all such other proceedings may be had in the premises as to law and justice may appertain, and as said chapter 177 of the acts of the year 1872 may require.

JAMES J. STORROW, Attorney and of Counsel.

The answer of the city is as follows:—

ANSWER.

Commonwealth of Massachusetts. Middlesex, ss.

ESSEX COMPANY, PETITIONER FOR DAMAGES AGAINST THE CITY OF BOSTON.

1. And now come said City of Boston, and for answer to the allegations of said petitioners say, that they admit it to be true, as therein averred, that the petitioners were in possession of the land therein described at the times therein set forth, but said defendants deny that the petitioners were the lawful owners of the water-power therein described, and require them to make such proof, as they are advised, of the ownership of such water-power.

2. And the defendants, further answering, admit that the Sudbury river is one of the branches and tributaries of said Concord river, which is a branch of the Merrimack river, and the waters thereof, and the streams running into the same would naturally flow into said Merrimack river, and flow into and make a part of a head of water raised by dam at Lawrence, as set forth

in said petition.

3. The defendants, further answering, aver that said Essex Co. does not own any rights in said water-power, except it may be certain indefinite rights in common with other parties who have suffered damages jointly with them, if any, by the alleged taking, or any taking of the water of Sudbury river by the City of Boston, and the defendants claim that this petition for damages for the taking of the water of Sudbury river by said Boston, under and by virtue of the act of the Legislature, as set out in the petition, should have been brought by the petitioners jointly with various persons to the defendants unknown, who claim to own rights in said water-power, subject to certain rights, reservations and conditions therein, who are all jointly owners, or jointly interested in common, and not in severalty in said water-power with said petitioners; and said petition of said Essex Co., if it may be sustained at all, should be jointly with the other owners, in common of said waters and water-power, who claim damages against the city, because of the taking of said water, and not severally by each, because the defendants say that the water-power of said Merrimack river, at said Lowell, being undivided, it would be exceedingly burdensome and expensive to said defendants to be called upon to divide and show how the taking of said water of Sudbury river would affect the owners and claimants of the water severally, so as to protect themselves against the several claims of each owner therein. And they therefore pray the Court that this petition may be dismissed for non-joinder of the other owners of said water-power, or that all of the owners of any rights in said water-power, created by said dam at said Lawrence, may be ordered to come in and join as parties in said petition so that there shall be but one assessment of damages for one act of taking by said city of said water, and for a joint injury thereby to said waterpower owned by the parties aforesaid.

4. And the defendants, further answering, deny that they have taken and diverted and withdrawn any of the waters of Sudbury river before the filing of said petition under the authority conferred by said act, set forth in said petition, in the manner and form therein set forth, or otherwise by said city acting under and by

virtue of the authority of said act.

5. And the defendants, further answering, say that said petitioners, and the owners of said water-power at said Lawrence, on the Merrimack river, are not, and will not be damnified by the taking of the water of Sudbury river under said act, nor do they have any right therein or thereto, because they say that by the act of the General Court of Massachusetts, passed June 22, 1793, to which, with the acts additional thereto, the defendants beg leave to refer as part of their answer, certain persons therein named were incorporated by the name of the Proprietors of the Middlesex canal, as a perpetual corporation for the sole object of uniting the waters of the Medford river and Charles river in said county, by cutting a canal for that purpose, "provided that whereas it may be necessary in the prosecution of the foregoing business that

the property of private persons may, as in the case of highways,

be appropriated to public use."

public highway."

It was also enacted therein that in the case where any person shall be damaged in his property by said proprietors in any manner, if said proprietors do not make or tender reasonable satisfaction to the acceptance of the person damaged by them, such person may apply within one year for a committee to estimate the damages so done, and such proceedings shall be had, that a committee should be appointed to estimate the damages and make return thereof to the next Court of General Sessions of the Peace, and that execution should issue thereon with a right of appeal to a jury for an increase of said damages.

And the jury or committee, as the case might be, were empowered to give either a sum in gross for damages, or annual damages during the continuance of said damage, and the party

injured was to have judgment and execution thereof.

And it was also further enacted that the proprietors were authorized and empowered to purchase and hold to themselves and their successors forever, so much land and real estate as may be necessary for the purpose aforesaid, not exceeding the value of five thousand pounds; "provided that no water-course shall be turned or altered where any mill is erected, so as to injure such mill, without license therefor first had and obtained from the General Sessions of the Peace in the county through which said water-course may pass. And that the said Court, on application made to it by said proprietors, shall observe the same rules as are now prescribed by law when application is made to them for granting a

And the defendants further say that by an act in addition to the act above referred to, passed on the 28th day of February, in the year 1795, it was enacted that "the property of said proprietors in said canal, and in any other canal connected therewith which they shall effect pursuant to the authority of the government, and real estate of said corporation of which the said corporation shall be seized, shall be divided into eight hundred shares," which were to be personal property for certain purposes only; and it was further therein enacted by the second section of said act "that said corporation shall have power to receive and hold real estate as appendant to said canal, and for the purpose of facilitating its business, to the sum of £30,000, over and above the value of the canal itself, simply considered;" and they were further empowered to make the waters of the Concord river boatable as far as Sudbury causeway, and as much further as the same can be usefully improved for that end; and to open any canal at any place in said County of Middlesex that may be necessary to connect the Concord river with said Middlesex canal for that purpose, and that the proprietors shall be liable to have damages recovered against them by any individual who shall be injured or damnified in his property in such new canal, by the same mode of process and in the same manner as is in the same act provided.

And said defendants, further answering, say that, under said act of incorporation, surveys being made, it was found that it was impossible, without great and inordinate expense, to take the

waters of the Merrimack river through a canal to unite with the waters of the Medford river near said Boston, because it appeared that the waters of said Merrimack river, at a point where they were to come into said canal, were some twenty or more feet lower than the waters of the Concord river at said Billerica, at the

point where said canal must pass the same.

And the defendants, further answering, say, that by an act, in addition to the several acts respecting the proprietors of the Middlesex canal, passed June 25, 1798, it appears that "whereas by an act passed February 28th, 1795, it is provided and enacted that the corporation of the said Middlesex canal shall be empowered to hold real estate, as appendant to said canal, for the purpose of facilitating the business of the same to the value of 30,000 pounds over and above the value of the canal itself; and the proprietors of said canal, having expressed their doubts whether in virtue of said act they may erect and hold mills on the same canal, and on the waters with which it is or shall be connected; it is enacted that the corporation of the Middlesex canal, or the proprietors of said canal, in their corporate capacity, shall be empowered to purchase and hold any mill-seats on the waters connected with the same canal, and lands to accommodate the same, and thereon to erect mills."

And the defendants, further answering, say, that by an act, in addition to the several acts passed respecting the Middlesex canal, passed January 26, 1800, it is recited "that the proprietors of the canal have in their petition set forth that from a reservation in the acts already passed in their favor, the government has a right to regulate the toll of goods carried on the canal anew after the expiration of forty years, from which provisions great discouragements and embarrassments have resulted in the execution of that project; therefore be it enacted that a toll of one-sixteenth part of a dollar for each ton carried one mile on the same canal be estab-

lished for said proprietors and their successors forever."

And that afterwards, by an act, in further addition to the acts incorporating the proprietors of the Middlesex canal, passed March 2, 1803, said proprietors were allowed the term of three years from and after the 22d day of June the next, to complete the same canal to Charles river, and to effectuate means of communication between said canal and the town of Boston across said Charles river by boats, and were allowed the further term of six years to render Concord river boatable and navigable, and for cutting their canals

in the County of Middlesex.

And the defendants, further answering, say that in 1798, after the passage of said act of that year, the proprietors of the Middlesex canal purchased said mill privileges on the Concord river at Billerica, and erected a dam for the purpose of raising a head of water to supply their canal, using the surplus to operate their mills, the grist-mill formerly on said stream having the first right; that in 1804 they completed their canal from Merrimack river to Charles river, and opened it for public navigation, taking toll therefor, using the head of water so raised in Concord river to feed their canal, and the surplus, whenever any there was, to run their said mills.

And the defendants, further answering, say, that in 1826, finding their dam insufficient to raise the water for their purposes, said proprietors built a new and more permanent dam in connection with the old one, which is the dam now maintained by one Faulkner and others, petitioners for damages against said

city.

And the defendants, further answering, say that from the year 1804 down to the year 1851 the proprietors carried on their canal, using in the dry seasons of the year all the water of the river for keeping up the navigation on their canal, and the surplus for their own mills, the canal retaining the first right thereto, and said proprietors claim to hold and have the right to use all the water of said Concord river for the purposes of navigation, and the rights of the public therein until the same may be lawfully discontinued; and that afterwards they applied for leave to wind up their affairs, to the Supreme Judicial Court sitting in and for the County of Suffolk, which leave was refused and their petition dismissed; all said water is still holden for a public use.

And the defendants, further answering, say that all the water of the Concord river, including that of Sudbury river, was taken, held and appropriated forever for a public use; to wit, to be diverted from said Concord river, and was so diverted into Charles river, and into Merrimac river, to furnish means of navigation in a public canal, opening above said dam at Lowell, to wit, at Billerica, and that damages were paid for such public use of said water, to all persons having any right therein, and injured by such diversion, and especially to those under whom the petitioners

claim.

And the defendants, further answering, say that the proprietors of said Middlesex canal had not, under their charter and the several acts in addition thereto, any right or power to sell or convey or assign any right to any person whomsoever, to use said water as against any other public use of the same, which taking of

said water by the City of Boston is for a public use.

And said defendants, further answering, say that said water of the Concord river was, in the manner and for the purposes and use aforesaid, and by the proprietors of said canal, taken, used and diverted from the Concord river during the greater part of the year, and especially in the dry season thereof (when alone said petitioners would or could suffer any loss or damage by the taking of the waters of Sudbury river), at Billerica, into said canal to Charles river and Merrimac river, the said Concord river being used at said Billerica, which is a point four miles above the dam at said Lowell, as a feeder to said canal. And that the quantity of water so taken and diverted was at all times much greater than the whole natural flow of water received into said Concord river from said Sudbury river.

And that those under whom said petitioners claim to hold said water-power received compensation for all damages sustained to said mill-privileges and dam and water-power at said Lawrence by reason of the taking and diversion of said water for a public use;

and the petitioners are not entitled again to receive damages for

any diversion of said water for any other public use.

Wherefore the defendants ask to be dismissed of this petition, and go thereof without day, and for their reasonable costs in this behalf sustained.

L. M. CHILD, B. F. BUTLER,

Attorney and Counsel for the City of Boston.

The first statute to which I shall refer is chapter 177 of April 8th, 1872:—

"An Act to Authorize the City of Boston to Obtain an Additional Supply of Pure Water.

"Be it enacted, etc., as follows:—

"Section 1. The City of Boston is hereby authorized, by and through the agency of the Cochituate Water Board, to take, hold and convey to, into and through said city, all the water of Sudbury river, so called, said water to be taken at any point or points within the town of Framingham, or higher up on said river, and the water of Farm pond, so-called, in said town of Framingham, and the waters which may flow into and from said river and pond, and to take any water rights in or upon said river or pond, in or above the town of Framingham, or connected therewith."

Then there is authority for them to take and hold lands: -

"Said city may also take and hold, by purchase or otherwise, in connection with the said sources of supply, any lands or real estate necessary for increasing or preserving the purity of the water, or for laying, building and maintaining aqueducts, water-courses, reservoirs, dams, buildings, machinery and other structures and appliances, with their accessories, for conducting, elevating, purifying, storing, discharging, disposing of and distributing water; and may also take and hold any land, excepting any in the town of Framingham heretofore taken or purchased by any railroad company, on the margin of said sources of supply, not exceeding five rods in width from the high-water line of said river; storage, reservoirs or pond, so far as may be necessary, in the opinion of said Cochituate Water Board, for the preservation and purity of the same, for the purpose of furnishing a supply of pure water for the City of Boston."

Sect. 2 authorizes them to build one or more permanent

aqueducts.

Sect. 3 authorizes them to make storage reservoirs.

SECT. 4. "Nothing contained in this act shall be so con-

strued as to authorize the City of Boston to reduce the water in Sudbury river below a sufficient height to maintain at all times a running stream therein, which shall flow at least one and one-half million gallons a day for each and every day in the year, or to draw from Farm pond or Sudbury river into Lake Cochituate when the water runs over the dam at Lake Cochituate, or to prevent the inhabitants of the towns of Framingham, Ashland, Southborough, Hudson and Westborough from taking from the Sudbury or Assabet rivers or Farm pond so much of the water hereby granted as shall be necessary for extinguishing fires, and for all ordinary domestic and household purposes, and for the generation of steam, or from cutting and carrying away ice from said pond; or as to prevent the Boston and Albany Railroad Company, or the Mansfield and Framingham Railroad Company, or the Boston, Clinton and Fitchburg Railroad Company, from taking water from Farm pond for use in locomotive or other engines, or for other railroad purposes, under such regulations of the City Council of the City of Boston as may be essential for the preservation of the purity of the same."

SECT. 5. "The City of Boston shall be liable to pay all damages that shall be sustained by any persons in their property by the taking of or injury to any land, real estate, water or water-rights, or by flowage of the lands of any persons, or by the interference with, or injury to, any use or enjoyment of the water of said river, to which any person, at the time of such taking, is legally entitled, or by any other doings under this act; and in regard to such taking, injury, interference and flowage, and the ascertainment and payment of all such damages, the said City of Boston, and all persons claiming damages, shall have all the rights, immunities and remedies, and be subject to all the duties, liabilities and regulations which are provided in the one hundred and sixty-seventh chapter of the acts of the year eighteen hundred and forty-six, and the three hundred and sixteenth chapter of the acts of the year eighteen hundred and fifty."

The rest of the statute is not material. This section provides for the payment of damages in the taking of water, and so on.

The 167th chapter of the acts of the year 1846 reads as follows:—

THE CHAIRMAN. — There is also one other chapter referred to.

Mr. Storrow. — That is the second water act — an amendment; it merely extends the time for claiming damages, and makes some other provisions as to the proceedings.

Mr. Butler. — That has nothing to do with this.

Mr. Storrow. — This chapter, chapter 167 of the acts of the year 1846, reads as follows: —

It is entitled "An act for supplying the City of Boston

with pure water."

It then goes on to state that the city commissioners may take the waters from Long pond, and so on, and provides that "The City of Boston shall, within sixty days from the time they shall take any lands or ponds or streams of water for the purpose of this act," — and here is a material clause in this section, — "The City of Boston shall file in the office of the Registry of Deeds, for the county where they are situate, a description of the lands, ponds or streams of water so taken, as certain as is required in a common conveyance of lands, and a statement of the purpose for which taken, which said description and statement shall be signed by the

said mayor."

"Section 6. The said City of Boston shall be liable to pay all the damages," and so on. "And if the owner of any land, water, or water-rights, which shall be taken as aforesaid, or other person who shall sustain damage as aforesaid, shall not agree upon the damages to be paid therefor, he may apply, by petition, for the assessment of his damages, at any time within three years from the taking of the said land, water or water-rights, as aforesaid, and not afterwards, to the Court of Common Pleas, in the county in which the same are situate; such petition may be filed in the clerk's office of said Court, in vacation, or in term time, and the clerk shall thereupon issue a summons to the City of Boston, returnable, if issued in vacation, to the then next term of the said court, and if in term time, returnable on such day as the said court shall order, to appear and answer to the said petition; the said summons shall be served fourteen days, at least, before the return day thereof, by leaving a copy thereof, and of the said petition, certified by the officer who shall serve the same, with the mayor or clerk of the said city; and the said court may, upon default or hearing of the said city, appoint three judicious and disinterested freeholders of this Commonwealth, who shall, after reasonable notice to the parties, assess the damages, if any, which such petitioner may have sustained as aforesaid; and the award of the said freeholders, or of the major part of them, being returned into and accepted by the said Court, shall be final, and judgment shall be rendered and execution issued thereon for the prevailing party, with costs, unless one of the said parties shall claim a trial by jury, as hereinafter provided."

It is under these statutes that the commissioners are ap-

pointed and are to act.

I propose before I put in our testimony to state to you the nature of our case and the character of the proof by which we expect to sustain it, and in the course of doing so it will be convenient for me to read one or two passages from the charter of the Essex Company, which we shall put in proof by and by.

The first act to incorporate the Essex Company was in

1845, chapter 163. The 1st section is as follows:

AN ACT TO INCORPORATE THE ESSEX COMPANY.

Be it enacted by the Senate and House of Representatives, in General Court assembled, and by the authority of the same, as follows:—

SECT. 1. Samuel Lawrence, John Nesmith, Daniel Saunders, and Edmund Bartlett, their associates and successors, are hereby made a corporation, by the name of the Essex Company, for the purpose of constructing a dam across Merrimack river, and constructing one or more locks and canals in connection with said dam, to remove obstructions in said river by falls and rapids, from Hunt's Falls to the mouth of Shawsheen river, and to create a water power to use, or sell, or lease to other persons or corporations to use for manufacturing and mechanical purposes; and, for these purposes, shall have all the powers and privileges, and be subject to all the duties, and liabilities, and restrictions, set forth in the thirty-eighth and forty-fourth chapters of the Revised Statutes.

SECT. 2. Said corporation may hold real estate not exceeding, exclusive of the expenditure for the dam and canals, three hundred thousand dollars, and the whole capital stock of said corporation shall not exceed one million dollars, and said stock shall be divided

into shares not exceeding one hundred dollars each.

SECT. 3. The said corporation is hereby authorized and empowered to construct and maintain a dam across said river, either at Deer Jump Falls, or Bodwell's Falls [Bodwell's Falls is the place where the dam was actually. Deer Jump Falls is seven miles above, or some point in said river between said falls, and all such canals and locks as may be necessary for the purposes aforesaid; and for the purpose of making said dam, and constructing the main canal for navigation, or transports, may take, occupy, and enclose any of the lands adjoining said canals and locks, or dam, which may be necessary for building or repairing the same, for towing paths and other necessary purposes, not exceeding twenty feet on each side of said canal, or locks, and may blow up and remove any rocks in said river, and dig in any of the lands near to said river, through which it may be necessary to pass said main canal: provided, that said corporation shall not obstruct the passage of rafts, masts, or floats of timber down said river earlier

than the first day of June, in building said dam, nor keep the same obstructed for a longer time than five months before the

opening of said canal for the passage thereof.

Sect. 4. If there shall be occasion, in the prosecution of the powers and purposes aforesaid, to make a canal across any public highway, or if highways shall hereafter be laid out across such canal, it shall be the duty of said corporation to make sufficient bridges across said canal, and to keep them in good repair.

Sect. 5. The said corporation shall make and maintain, in the dam so built by them across said river, suitable and reasonable fishways, to be kept open at such seasons as are necessary and

useful for the passage of fish.

Sect. 6. The said corporation shall erect, and forever maintain such canal and locks as shall be necessary around any dam constructed by them; the locks to be not less than twenty feet in width, and ninety feet in length; and said canal shall be so constructed, that there shall be easy, safe, and convenient access to, and egress from, the same; with fastenings and moorings for the reconstruction of rafts or floats, after the egress; and shall be free and not subject to any charges whatever for the passage of rafts of wood and lumber, masts, and floats of timber, and be tended by a keeper employed by said corporation, and opened at all reasonable

times, promptly, for such passage. . .

SECT. 10. The said dam shall not be built to flow the water in said river higher than the foot of Hunt's Falls, in the ordinary run and amount of water in the river, and a commission of three competent persons, to be appointed, one by the said corporation, and one by the proprietors of the locks and canals on Merrimack river; and a third, by the two thus appointed, shall, upon the application of either party, fix and determine, by permanent monuments, the point in said river, which is the foot of Hunt's Falls; and shall also, upon the like application, fix and determine the height of the dam of this corporation, and of the flash boards to be used thereon, whose award and determination shall be final and binding upon all parties forever. And if either party shall refuse, after request in writing by the other, for the space of thirty days, to name such commissioner, or in case of a vacancy in such commission, for any cause, either party may apply to the Governor of this Commonwealth, who is hereby empowered to fill such vacancy. And the said point of the foot of Hunt's Falls shall be fixed within sixty days after such application to the commissioners, and the height of the permanent dam shall be fixed and determined within one year after such application.

SECT. 11. This act shall take effect from and after its passage.

[Approved by the Governor, March 20, 1845.]

The next act is that of 1846, chapter 119.

"ACTS OF 1846, CHAP. 119.

- "AN ACT IN ADDITION TO AN ACT INCORPORATING THE ESSEX COMPANY.
- "Be it enacted by the Senate and House of Representatives, in General Court assembled, and by authority of the same, as follows:—
- "Section 1. The consent of this Commonwealth is hereby given, that the Essex Company may expend of their capital stock within the State of New Hampshire such sums of money as the said company may deem expedient in improving the power of the Merrimack river; and for this purpose the said company may, with the consent of the State of New Hampshire, acquire by purchase and hold real and personal property within the limits of that State." . . .

The next was the act of 1848, chapter 295, authorizing the Essex Company to increase their capital stock, and providing for the manner in which they should pay for damages

done to private fish-rights by their dam.

Without telling the whole story of all the charters,—which may or may not be material,—one of these charters refers to the right to do something up in New Hampshire to improve the power of the Merrimack river. That authorized the Essex Company to acquire real and personal property within the limits of that State, and under it they bought half the stock of the Winnipiseogee Lake Cotton and Woollen Manufacturing Co., of which the "proprietors of the locks and canals," owners of the Merrimack river waterpower at Lowell, bought the other half.

It was an old corporation — of the old style of manufacturing corporations; but at the time the Essex Company acquired the right, before mentioned, the Legislature of New Hampshire passed an act, dated July 10, 1846, en-

titled

"AN ACT IN ADDITION TO AN ACT TO ESTABLISH A CORPOR-ATION BY THE NAME OF THE WINNIPISEOGEE LAKE COT-TON AND WOOLLEN MANUFACTURING COMPANY.

"Section 1. Be it enacted by the Senate and House of Representatives, in General Court convened, That the said corporation is authorized to increase its capital stock to the amount of one million of dollars, to be held, used and enjoyed under the same liabilities and with the same powers and privileges as are provided in the act to which this is an addition, to be assessed and paid at such times and in such sums as the directors of said corporation may from time to time order.

"Sect. 2. That said corporation shall have power to acquire

and hold, in this State, such real and personal estate, not exceeding in the whole the said sum of one million dollars, as may be necessary to improve the water powers of the Winnipiseogee. Pemigewasset and Merrimack rivers, and for that purpose to make such contracts and grants to and with the proprietors and owners of lands, mills and mill-privileges on the said rivers, and their tributary streams and waters, as may be necessary to accomplish those objects.

"Sect. 3. That all individuals and corporations owning mills or mill-privileges upon either of the said rivers, or their tributary waters, may subscribe for and hold stock in said corporation, and any such corporation so holding stock may appoint an agent to represent the same at all corporate meetings held according to

the laws of this State.

"Sect. 4. That any Legislature may hereafter, upon due notice, and for cause assigned, alter or amend this act, and may repeal the same for a violation of the provisions thereof.

"[July 10, 1846.]"

It was under these charters that the Essex Company built their dam, beginning it in 1845 or '46, and finishing it about 1848 or '49. By that dam — to use what I think is the very happy language of the act — they "created a water-power" to be used by them, or to be sold and leased to others for manufacturing and mechanical purposes. They have sold and leased some to others, and a considerable portion remains.

Under the provisions of that charter they bought a very large quantity of land, substantially the whole of what is now the city of Lawrence, for they perceived that that territory, which then was of no value at all, — covered, the whole of it I think, by a population of 150 persons, — would grow into a large city, and would become very valuable; and they looked for their profits not merely to the actual use of the water-power itself, but to the increased value which that use on the spot would give to other land which they owned, adjoining it. And their expectations have been so far realized that this territory is now covered by a population of 35,000 people. Such has been the addition which has been made to its value and its attractiveness by means of the creation of this water-power by the petitioners, and its use where they created it.

The taking by the city, you will remember, by the statutes was to be accompanied with the filing of a certain record in the Registry of Deeds in the county where situate. I have here a certified copy of that record, and as it has got to be read some time, it may be as well to read it now. It is dated the 21st day of January, 1875, and was filed in

the Registry of Deeds, March 17th, 1875.

GEN. BUTLER. — [To the Commissioners.] — It was to be filed within sixty days from the taking.

Whereas, by an act of the Legislature of the Commonwealth of Massachusetts, passed the 8th day of April, 1872, entitled: "An act to authorize the City of Boston to obtain an additional supply of pure water," it is provided, among other things, that "The City of Boston is hereby authorized by, and through the agency of the Cochituate Water Board, to take, hold, and convey to, into and through said city, all the water of Sudbury river, so called, said water to be taken out at any point or points within the town of Framingham, or higher up on said river, and the water of Farm pond, so called, in said town of Framingham, and the waters which may flow into and from said river and pond, and to take any waterrights in or upon said river or pond in or above the town of Framingham, or connected therewith;" and by section fifth of said act, it is likewise provided, that in regard to such taking, injury, interference and flowage, and the ascertainment and payment of all such damages, the said City of Boston and all persons claiming damages shall have all the rights, immunities and remedies, and be subject to all the duties, liabilities and regulations which are provided in the one hundred and sixty-seventh chapter of the acts of the year eighteen hundred and forty-six, and the three hundred and sixteenth chapter of the acts of the year eighteen hundred and fifty; and, whereas, in said one hundred and sixty-seventh chapter of the acts of the year 1846, it is provided, that the City of Boston "shall within sixty days from the time they shall take any lands, or ponds, or streams of water for the purposes of this act, file in the office of the Registry of Deeds where they are situate, a description of the lands, ponds, or streams of water so taken, as certain as is required in a common conveyance of lands, and a statement of the purpose for which taken, which said description and statement shall be signed by the said Mayor; and, whereas, pursuant to the provisions of section first, of chapter one hundred and seventy-seven of the aforesaid acts of 1872, it was ordered by the City Council of the City of Boston" that the Cochituate Water Board, as the agent of the City of Boston, be, and it is hereby directed, to take, hold, convey to, into, and through said city, all the water of Sudbury river, so called, said water to be taken at any point or points within the town of Framingham, or higher up on said river, and the water of Farm pond, so called, in said town of Framingham, and the waters which may flow into and from said river and pond, and to take any water-rights in or upon said river or pond in or above the town of Framingham or connected therewith, said Cochituate Water Board is also hereby directed, as the agent of this city, to take and hold by purchase or otherwise in connection with said sources of supply, any lands and real estate necessary for increasing or preserving the purity of the water, or for laying, building and maintaining aqueducts, water-courses, reservoirs, dams, buildings, machinery and other structures and appliances, with their accessories for conducting, elevating, purifying, storing, discharging, disposing of and distributing water;

and also to take and hold any land (excepting any in the town of Framingham heretofore taken or purchased by any railroad company) on the margin of said sources of supply, not exceeding five rods in width, from the high-water line of said river, storage, reservoirs or pond, so far as may be necessary, in the opinion of said water board, for the preservation and purity of the same for the purpose of furnishing a supply of pure water for the City of Boston; the expense of the taking of said waters and lands aforesaid, to be charged to the appropriation already existing therefor. Provided, however, that until the further order of the City Council no land shall be taken for the construction of a conduit between Farm pond and the Chestnut Hill reservoir, and no money shall be expended therefor beyond the amount of the appropriations already made. Now, therefore, know all men by these Presents, that the City of Boston, by the Cochituate Water Board aforesaid, Thomas Gogin, Leonard R. Cutter, Charles R. McLean, L. Miles Standish, William G. Thacher, Edward A. White, and Edward P. Wilbur, duly appointed and constituted and by virtue of the power and authority in said act given and in part execution of the same, have taken, and by these presents do take, for the sole use and benefit of the said City of Boston, all the water of Sudbury river, so called, at and above the dam built by the City of Boston in 1872, five hundred feet more or less below the crossing of the said Sudbury river, by the Boston, Clinton and Fitchburg Railroad, in the town of Framingham, in the county of Middlesex, and near the brook which is the outlet from Farm pond into said river, and all the water in the said dam to the source or sources of said river; also, all the water in Farm pond, so called, in said town of Framingham, and all the water in the brook connecting Farm pond with Sudbury river; also, all the water in all streams, brooks and rivulets, or water-courses of any kind, whether natural or artificial, that may flow into or from said Farm pond, and into or from said Sudbury river at any point or points above said dam, subject to the restrictions set forth in section four of chapter one hundred and seventy-seven of the laws of 1872, with reference to said water. To have and to hold the said waters to the said City of Boston, and its successors and assigns, to its and their sole use and behoof, agreeably to the provisions of the said act of the year eighteen hundred and seventy-two. In witness whereof, I Samuel C. Cobb, Mayor of the said City of Boston, and the said Cochituate Water Board, have prepared the foregoing description of the waters taken for the purposes aforesaid in conformity to the requirements of the acts aforesaid, to be filed in the office of the Registry of Deeds for the said county of Middlesex, and have hereto set our hands and affixed the common seal of the City of Boston, being hereto duly authorized this twenty-first day of January, in the year eighteen hundred and seventy-five.

Signed and sealed in presence of James L. Hillard.

[Seal.] City of Boston by Samuel C. Cobb, Mayor; Thomas Gogin, President; Edward A. White, Charles R. McLean, William G. Thacher, L. R. Cutter, Edward P. Wilbur, L. Miles Standish. Middlesex, ss., March 17th, 1875. Received and recorded.

Attest: Charles B. Stevens, Register.

GEN. BUTLER. — [To Mr. Storrow.] — You will read, if you please, in this connection Section 8 of the act — which you did not read.

Mr. Somerby. — Section 8 of the Acts of 1872?

Mr. Storrow. — No; Section 8 of the Acts of 1846. "No application shall be made to the Court for the assessment of damages, for the taking of any water-rights, until the water shall be actually withdrawn or diverted by the said city under the authority of this act; and any person or corporation whose water-rights may be thus taken and effected may make his application aforesaid, at any time within three years from the time when the waters shall be first actually withdrawn or diverted as aforesaid."

Gen. BUTLER. — [To the Commissioners.] It makes a difference between the taking of water and the taking of land. The taking of land is to be from the time of filing the "taking." The taking of water is from the time when the

waters shall be first actually withdrawn or diverted.

Mr. Storrow. — Now, may it please the Commissioners, the purpose for which you are sitting here is to assess damages; to ascertain the injury in money which we have suffered by this taking. The object of taking by the right of eminent domain is not to enable the persons in whose behalf that right is exercised by the Commonwealth to obtain any property at any less price than they ought otherwise to get The object is to devise the means of fixing a price which should fairly induce the persons who have it to sell to part with it, fixing a price which, fairly considering their uses at the present time and their expectations in the future, will make them as well off as they were before. I say that your business is to find that. That is your whole duty. You are not sitting here for the purpose of trying, as engineers, the amount of water which the Sudbury river furnishes, except so far as you incidentally must try that, or ascertain that, or make up your minds for the purpose of ascertaining the value which is taken. Of course, it is an element — a very important one; but, after all, money — the sum in dollars and cents — is the result which you are to arrive at.

You are to consider also its value to the the Essex Company, to be used or leased to others for manufacturing or mechanical purposes; and there is one reason why you should so consider it, and that is this: if the city is about to take a supply of water for domestic purposes, it is absolutely essential that they should have a supply to be relied upon every day in every month, and in every year for an indefinite series of years. It will not do to take a supply of water

and rely on it, if it should turn out that on some days the supply might be deficient by 10 or 30 per cent. In ascertaining the value of a source of water supply, it would not do to look at the total amount which the water-source will supply during a whole year, but only the lowest amount which can be relied upon for every day; a supply other than that is comparatively worthless for domestic uses, except so far as it may be used by being stored up in one season and let out in another. As a running supply it is only valuable for domestic uses, for the minimum that it will furnish; but for manufacturing purposes it is very different. You know perfectly well generally, and especially from what you saw this last week, that the mill-owner, if he owns all the water-power of the stream, will build his mill so as to use all the water he can get for every working day in the year; but just how much water he can use, just how much machinery, how much of a mill it will be profitable for him to put in over and above the amount which can be absolutely relied upon for absolutely every day, is a question which you have to consider; but it is clearly a good deal more than is

going to be run every day.

Now, practically the question you have got to ascertain is, how much of the water is useful to us — to any manufactory at Lawrence — and can profitably be used in mills; because, if it can be profitably used, we can use it ourselves or lease it to others and derive a daily revenue, or get a round sum paid us for the right to use it. There are a great many ways in which a mill-owner will use more than the constant supply of a stream. He may, at some seasons when business requires it, drive harder than at others. He may run his business so that a slight drought will not seriously inconvenience him, because the case will not be water furnished so much every day and none during the remaining days, but so much furnished during so much of the year, and a somewhat less amount, but still a very considerable amount, during the remainder of the year. Then, a saw-mill or grist-mill in the old-fashioned times would run in high water and stop in the summer during a drought. Now, a mill of any considerable size will put in an engine simply by way of precaution against accidents to their motive power, and for times of back water, and the cost of the extra use of that engine one, or two, or three weeks during the drought of the summer is comparatively small. So that in this and in many other ways a mill-owner may use the river water when he has it, during most of the time, and get just as much value from it for each day when he does have it, as if he had it all the time, and when he has not got it he will supply

the deficiency from some other source; — and he will put in

machinery enough to make such use.

You will find by and by there are means for profitably using the very large water-power at Lawrence; that there is a market for the Essex Company to profitably sell a larger amount, or a larger proportion of surplus power than any one mill can use.

Before I go further I think I will define a word which we shall have to use a good deal, and that is "mill-power"—a mill-power, as we understand it at Lawrence; and it is in this sense that I shall have occasion to speak of it. It is thus defined in the paper I hold in my hand, and which is

the indenture under which the powers are sold: —

"Each mill-power is declared to be the right to draw from the nearest canal or water-course of the grantors, and through the land to be granted, so much water as shall give a power equal to thirty cubic feet of water per second when the head and fall is twenty-five feet; and no more is to be drawn in any one second, nor is the same to be drawn more than sixteen hours in each day of twenty-four hours; and, in order to prevent disputes as to the power of each mill privilege in the variations of the height of the water from changes of the season or other causes, it is understood and declared that the quantity of water shall be varied in proportion to the variation of the height, one foot being allowed and deducted from the height of the actual head and fall, and also from that with which it is compared before computing the proportion between them. Thus, on a head and fall of thirty feet, the quantity of water to be used would be twenty-four cubic feet, and 24-29ths of a cubic foot per second."

That fraction comes from throwing away a foot on each computation. You will have this before you by and by; but the essential thing there is that the grant of a mill-power is not a guaranty of so much power; it is a right to draw water through certain hours of the day, limited by the provision that no more than a certain definite amount shall be drawn each second, and the amount to be drawn each second is to vary according to the height of the fall; and one fact which I will call your attention to is, that in times of great freshets, when there is heavy back-water, say six feet, the fall is substantially diminished six feet, and it takes more water to supply the mill-power. In times of drought, when the river is below the ordinary height, the raceway is very low and the head and fall is much greater, and it requires less water to supply the mill-power.

In estimating, therefore, the amount of water it takes to

supply a mill at Lawrence, we want to know, not how much water it takes to supply it at a certain time, but how much it takes to supply it at all times. The fall at Lawrence varies from 25 to 30 feet in round numbers; about 28 or 29 feet is the fall in ordinary summer weather. The head in the canal cannot be increased, because it would go over the sides of the canal, so that it does not raise the head; but the surface in the raceway below is raised, and so there is less fall.

Now, upon the question of the amount of water which the Sudbury river will furnish. Although it is easy, I suppose, to ascertain at a particular moment how much water can be furnished, it is excessively difficult to find how much a stream will furnish month in and month out for a long series of years. That cannot be done, except by a long, actual observation, continued, not through one month, or two months, but for many years.

 $\lceil Adjourned \ to \ 1.30 \ P. \ M. \rceil$

Afternoon Session.

Continuation of Mr. Storrow's Argument.

I was about to say something about the amount of water furnished by the Sudbury river at and above the point where the city has diverted it, and I was about to state it for the purpose of assisting you in arriving at such knowledge on that subject as you may find convenient to aid you in ascertaining the value of the water, which is the real object of this Commission: —

The Essex Company at Lawrence for a good many years, tor their own purposes, have undertaken to ascertain the amount of water passing in the Merrimac river at Lawrence, every day of the year, or rather, I should say, every day except those days when possibly extraordinary occurrences, or more particularly when the presence of a large amount of ice in the river makes it impossible, as I am told, to get a correct ascertainment by the ordinary measurements; we confine our measurements to those months of the year when there has been no ice in the river. We have ascertained the amount of water flowing in the river at Lawrence, I suppose, with an accuracy with which no large stream has ever been measured, and the argument which we propose to address to you from the figures we have thus arrived at, and which will be laid before you, is this: having no accurate and long-continued measure of the value of the upper Sudbury-river area, taken at the outlet of that area, we shall show you that

the measurements at Lawrence are the measurements of the water which comes from the whole Essex Company's area of something upwards of four thousand square miles of which the Sudbury area forms a part. We shall then endeavor to show you that the upper Sudbury area, from actual observation by an intelligent witness, is at least as good productively, that is to say, the character of the country, the character of the slopes, the excellence of the territory as regards getting water into the streams, the excellence of the territory as regards its freedom from large evaporating surfaces, is at least equal to and possibly better than the whole average of the Essex Company's area. That being the case, and it being ascertained by measurements, that the Sudbury area, which is diverted from us by the City of Boston, is 1 of the whole area which hitherto has furnished the water that has come to us, we shall ask you to find that by the taking away of that $\frac{1}{57}$ of our area, proved to be at least up to the average of the whole, we have lost $\frac{1}{57}$ of the value of our water-power at Lawrence, and we think that that is a sound argument and one from which there is no escape; for if it be not sound, if in any way you can show that the subtraction of $\frac{1}{57}$ of a drainage area, every part of which was equal in its productiveness, did not subtract 1/57 of the value of the area, but took something less than that, you would at once, by taking 1 after another, arrive at the conclusion that having taken away step by step the whole of our area, you will have taken away the water which the whole of that area furnished. From that and many other similar arguments we expect you to find that that area, which is as good as the average of any other part of our territory, furnishes $\frac{1}{5\pi}$, and is worth to us $\frac{1}{5.7}$ of the whole territory of which it forms $\frac{1}{57}$ part.

I ask your attention just here to this consideration; the question, as I have said more than once, is not simply the amount of water which the Sudbury river furnishes; the question is, the value to us, situated as we are, of that con-

tribution to our water-power.

Now, I could conceive it possible that a mill situated exactly at the point of diversion might have some trouble at times from a very low amount of water, because other causes incidental to a comparatively small area will make a local drought, and afterwards there may come a heavy August rain which will make a week of high water; and these two circumstances make a fluctuation and a variation which are not desirable; but if you have 57 such areas to drain from we know that there we arrive, as we always do in taking large numbers, more nearly at an average which correctly

represents the truth; for the summer rain which makes this freshet on 1/57 of our area down at Sudbury does not fall up in New Hampshire where another 57th is situated, as the causes which make a drought on $\frac{1}{57}$ of our area down at Sudbury or up at the north do not operate on every other 57th; and even if they did, if it were true that every rain was simultaneous in time and in amount over the whole area, then this would be true, that the rain-fall from that part of our large area close to us would come to us the next day, whereas that from the area farthest off from us would take two, or three, or four, or five days before we got its effect. The situation of the Essex Company in this respect is unlike the situation of a mill situated just at the point of diversion, in this: that that $\frac{1}{57}$ is more valuable to us, being combined with the other $\frac{56}{57}$, than if it stood solely and alone; that is one advantage to our situation, and there are some other advantages. which I have alluded to once, arising from the large amounts of water and the large amounts of industries with which we connect. We shall produce to you a table showing the flow of the river as ascertained at Lawrence, stating the average flow per second for each month during a series of years, and we shall show you, from rain-fall tables and otherwise, that those years are rather under than over the average of the twenty years that preceded them. We shall submit to you that a mill will be built by a prudent owner large enough to use all of that water which he finds is the average, at least for the lowest month in a series of years.

And in order that you may have all of the facts before you, we shall show you in another list of tables, giving the average of the flow past Lawrence for each week of a series of years. Now, as I said before, I don't care very much precisely where the line falls between what is absolutely constant and what is constant 51, 50, 49 or 48 weeks in the year, because the difference of the value for manufacturing purposes of that which is constant 52 weeks in the year and that which is constant 51 weeks in the year is so small that it is not worth while to figure it up very closely except for the sake of finding exactly where the line falls between that which is constant 51 weeks and that which is constant 52 weeks. We shall put before you these tables to show what the flow is, and shall ask you to determine what is the value of a stream which has that flow. shall throw away and pay no attention to the great time of the freshet, when there is an amount of water larger than any mill can use, but we shall confine ourselves to the drier seasons of the year, and show you the amount of water which the Essex Company's water-shed has furnished, and

ask you to say what the value of that water-power is, and then divide it by 57, and thus say what the value of the

Sudbury portion is.

Upon the question of the difference of value to us of the power which is not absolutely permanent every day of the year, you know yourselves; and you know from what you have seen in the last week that a large and valuable use is made of the power which is not constant, because you have seen mills which are supplied with steam engines, and for a part of the year rely for a part of their power on steam, bearing in mind always that it is not a question, especially at a place like Lawrence, where water is brought from a great many sources, of no water at all during time of drought, but a question of the falling off of five or ten per cent., or some moderate percentage. We shall also show you, to assist you in that respect, that at Lawrence we derive from a certain number of powers, sold or permanently leased, which the mills regard, and I think justly regard, as entirely permanent, which are all that they have or expect to have, because we have refused to sell any more, that they use those, and have built machinery to use those. We shall show that they have put in machinery to use a large number of temporary, uncertain, or as we call them, "surplus powers," under an arrangement made with us, that when the river furnishes a supply of water in addition to what we or our grantees require for permanent use, they may use it if it is in the river, paying us a certain price per day for the use of it. Now you readily see, in the first place, that a millowner may well pay more per day for such surplus power, because in the way in which permanent powers are sold a certain gross sum is paid outright for the right to draw that amount of water forever, and that is paid whether they use the water or not; or a certain rental is agreed upon to be paid forever, so much a year or so much a day for three hundred days in the year, whether they use it or not; but as regards this temporary power, the mill-owner pays for the day in which he uses it, and does not pay for the day when he does not use it; and so within certain limits, to a certain extent, he can afford to pay more per day for this power and yet the power itself will not cost him any more for the time he actually uses it than a less price per day for power to be paid for, whether he uses it or not. We shall show you, at Lawrence, that the product, or what is equivalent to six per cent. on the price of such powers as we have sold as permanent powers, is a certain amount per year. We shall show you that under this arrangement about the surplus power, extending over a series of years, we have realized from

that source, from the use of the power which the mill-owners know is not constant, or the use of power which they have no right to use, and no power to take from us, except only when the river furnishes it, and we can spare it from other needs; that they have paid us year by year a very large sum, which bears a very large proportion to the productiveness of the permanent mill-powers sold by us. That will be an illustration from our own actual experience, past and continuing, of the profit which, situated as we are, we can realize from the water, which does not come to us every day in the year, and if that water is taken away from us we

suffer a corresponding loss.

Now, a city drawing water above the dam at Saxonville and Framingham draws it day and night, the whole 24 hours, and a city substantially uses it day and night, not so much in the night as the day, but uses a great deal. Upon the question of the profitable use a manufacturing company can make of water which runs day and night we have got this to say, — there are two ways in which they may use it: they may run their mills day and night. Some paper mills and some woollen mills run day and night under the pressure of active business. Another way in which we can make profitable the water which flows at night as well as that which flows at day is to concentrate that water by means of mill-ponds, or otherwise, into the ordinary working hours; say if, for example, 100 feet a second is flowing during each second of the working hours, we may be able to concentrate, or our situation may be such that we can make it come up to 200 feet a second during twelve hours, and we can, of course, make just twice as profitable use of it in that case as if we were obliged to take it 100 feet a second during twelve hours and let it run to waste at night. Now we shall show you that when the flow of the river at Lawrence is a certain gross amount for the whole twenty-four hours, which, in order to get it into smaller or more convenient figures we will express by an average of so many feet per second if it flowed equally during the whole twentyfour hours of the day, we can, by concentration, use the whole of that water during the working hours, and let nothing go to waste at night; the value to us, therefore, is not 100 feet per second, is not represented by dividing the total which flows through the day by the number of seconds in twenty-four hours, but by dividing the total which flows through the day by the number of seconds in twelve hours. Now that is one of those advantages which some mills possess and some do not.

Whether one mill possesses it or not depends upon its

situation, upon its works, upon the manner in which the water itself actually comes to it, - depends upon its own dam where it can so control the water as to make the waste water of the night really available in the day. A company is owning a water-power by means of which they can supply a deficiency from their water-shed when that deficiency would be a great source of injury to them; that enables them to make a far more profitable use of the water which they could not use if they did not have these appliances and resources, and if they have such appliances and resources the taking away that water causes them a greater injury, destroys more property, looking at water-power as property (for such it really is), than if they had not these resources; the question after all being the value of any water-shed for manufacturing purposes, which turns upon the question of how much machinery and wheels prudent mill-owners will put in to be carried by that stream; how much of the water of that stream can be used (for all the mill-owners can use we can use or sell); and that is the question you have got to answer. perfectly well that to have a small diminution, a twenty per cent. diminution in the source of the supply of a city during a week or two weeks in summer, would be a great disaster; so great a disaster that no city would count upon a supply which would expose them to encounter it; yet, to a millowner it is only a loss of a certain amount of power for those days, and not such an injury or destruction as to make it of no avail to use that water during the other days when it is there.

Having ascertained in that way how many mill-powers, or in other words how much machinery can be profitably used, and how much that total amount is diminished by the taking away of the Sudbury-river water, you will arrive so near the result that the only question which will remain for you is to ascertain how much a mill-power is worth. Now we shall offer you as evidence on that point the actual sales which we make at Lawrence, and in order that you may appreciate them justly, I want to state to you the character of the sales there, — what it is that we sell. We sell under this form of proposal, which you have had before you, the right to draw from the nearest mill-pond or canal of the Essex Company, through lands sold by the Essex Company to the grantee of this right, and to be used on that land and not elsewhere, a certain number of cubic feet of water per second. Now, the Essex Company, as I have already said, expect to make money not merely by the sale of waterpower, not from the number of dollars which was received from the sale of this water-power, and of the mill-site on which it is to be used, but from the improvement of its other land which it acquired, and to accomplish this by selling water-power to be used near it, and attracting a large population to that place; and you can readily understand that the Essex Company might give a man his water-power for nothing if he would come there and build a mill and buy from us that land to put his mill on and attract operatives and a large population there, and buy land from us for mill-sites and boarding-houses and attract a population so that everybody else who came there would want to buy land.

Now, that was the condition of the Essex Company; they looked for their profit, not merely to the number of dollars they received for the mill-powers alone, but to the improvement of their land, and what they knew would be the inevitable and necessary rise in the value of their land, which they never intended to use themselves, but which they bought for sale, — the \$300,000 worth of land which their charter authorized them to hold. We might consider a millpower worth \$100,000 in itself, and that not less than that would have satisfied us for our outlays and exertions in that respect; yet we might well sell it for \$20,000 if we knew that the inevitable result in selling that power, to be used on the land, would be to enable us to make \$80,000 profit by the sale of the land on which that was to be used and of the other land in that neighborhood; and you will readily understand that we might under those circumstances sell it to a man who was going to build a mill there for \$20,000, under those conditions expressed in our deed; yet if the proposition to us was to sell our mill-power for the water to be taken and used to fertilize the lands down on the Back Bay in Boston we should want a very different price to make the two sales equivalent. We shall offer you, as bearing on that point, evidence as to the profit which we actually make under those circumstances, showing you what we get for a mill-power subject to these conditions and restrictions, and the profit we shall make and have made from the use of that water-power on the premises; and we think that will enable you to find more readily the value of the water-power to be taken away and used on another man's premises twenty-five miles off, and to determine the money amount of injury which has been done to us by this taking from us, this diversion of water, which really after all is the one thing which we have got to determine.

HIRAM F. MILLS, sworn.

Q. (By Mr. Storrow). What is your profession?

A. I am a civil engineer.

Q. What has been your employment and occupation for a number of years past?

A. For the past six years I have been engineer for the Essex

Company at Lawrence.

Q. Whether or not you have paid attention, since you have been with the Essex Company at Lawrence, to ascertain the flow of the Merrimack river at Lawrence?

A. I have made daily measurements of the quantity of water

used by the mills there.

Q. Whether before going to Lawrence you have paid particular attention to the subject of hydraulics and water measurements?

A. I have.

- Q. For how many years?A. For twenty years.
- Q. Whether before you went to Lawrence you have had any particular experience in measuring the flow of rivers and ascertaining the amount of the water-power for other persons than the Essex Company?

A. I have. Q. Where?

A. At Lowell and at various other places; at Cohoes, on the Mowhawk river, and in Maine.

Q. Have you prepared a table showing the monthly averages of the flow of the Merrimack river past the works of the Essex Company at Lawrence?

A. I have.

Q. Will you produce it?

- A. I have here the monthly averages during the months from May to October in the different years from 1871 up to the present time.
- Q. If I understand that table, the figures in the first column represent the number of cubic feet per second, assuming the flow to be uniform throughout the whole twenty-four hours?

A. Yes, sir.

Q. I also understand that it represents the number of cubic feet passing, for example, during the month of May, assuming that during every second of that month the flow was uniform?

A. Only the working days; twenty-four hours on the working

days. The quantity passed on Sundays is not included.

Mr. Commissioner Russell. — We will mark this paper, if you please, "H. F. M. 1."

Monthly averages of the quantity of water flowing in the Merrimack river at Lawrence on working days, in cubic feet per second, for twenty-four hours:—

DATE. 1871.							Quantity passing.	Average quantity drawn from lakes.
May .							11,848	
June .		•		•			4,471	
July .							2,998	90
August .							3,058	90
September	•						3,094	47
October .							4,357	68
	Ť	Ť	-				_,	
1872.							0.060	
May .	•	•	•	•	•	•	9,260	
June .	•	•	•	•	•	•	10,528	
July .	•	•	•	•	•	•	4,922	
August .	•	•	•	•	•	•	9,014	
September	•	•	•	•	•	•	9,559	
October .	•	•	•	•	•	•	9,164	
1873.							,	
May .							16,174	
June .							4,320	
July .							3,065	
August .							2,966	52
September							3,400	277
October .							10,914	
	Ť						,	
1874.							10.001	
May .	•	•	•	•	•	•	19,091	
June .	•	•	•	•	•	•	11,230	
July .	•	•	•	•	•	•	11,126	
August .	•	•	•	•	•	•	5,389	0.0
September	•	•	•	•	•	•	3,152	80
October .	•	•	•	•	•	•	3,195	55
1875.								
May .							12,501	
June .							5,624	
July .							3,075	
August .							3,999	
September		Ĭ		·			2,618	123
October .			Ĭ		_	Ĭ	3,767	39
	•	•	•	·		·	٥,٠٠٠	00
1876.							17 200	
May .	•	•	•	•	•	•	17,398	
June .	•	•	•	•	•	•	6,792	
July .	•	•	•	•	•	•	2,994	4.70
August .		•	•	•	•	•	2,791	153
September	•	•	•	•	•			
October .	•	•	•	•	•	•		

Q. (By Mr. Storrow.) I will ask you now whether you have prepared a table averaging for each week, at the times when the water has been the lowest, at the times when the water has been

flowing at the rate — say, at a rate equivalent to less than 3,000 feet a second — from the first of May, 1871, until the first of September, 1876?

A. Yes, sir; covering the six summer months.

Q. (By Mr. Abbott.) It don't take the full year, but the six summer months?

A. Yes, sir.

Commissioner Russell. What is the second table?

Mr. Storrow. The second table covers from the first of May to the first of November, when the flow is not equivalent to more than an average of 3,000 feet a second, because it is only about that amount, or a little below that amount, when it becomes necessary to have the figures with precision; for somewhere in that neighborhood the question to be determined lies.

Commissioner Russell. We will mark this "H. F. M. 2."

Weeks in which the average quantity flowing in the Merrimack river at Lawrence was less than 3,000 cubic feet for twenty-four hours, May to October inclusive, in the years 1871–1876.

may to october	11000	more, i	10 010	c gears	10	711-1010.	
1871.						Quantity flow- ing in river.	Quantity ordered from reservoirs.
July 10 to 15						2,947	200
17 to 22						2,783	100
24 to 29						2,795	150
Aug. 7 to 12						2,880	
14 to 19						2,670	
21 to 26						2,568	233
Sept. 11 to 16	Ĭ		Ĭ			2,672	200
18 to 23		·				2,408	100
25 to 30	•	·	Ů	•		2,392	83
Oct. 2 to 7	•	•	•			2,205	290
000. 2 00 1	•	•	•	•	•	2,200	200
1872-1873.							
June 23 to 28			4			2,465	
30 to July 5		• •	•	•		2,284	
July 7 to 12	•	•	•	•	•	2,899	
14 to 19	•	•	•	•	•	2,632	
Aug. 11 to 16	•	•	•	•	•	2,657	
25 to 30	•	•	•	•	٠	2,859	33
Sept. 1 to 6	•	•	•	•	•		425
8 to 13	•	•	•	•	•	2,772	
	•	•	•	•	۰	2,975	266
15 to 20	•	•	•	•	•	2,755	450
70.00							
Sept. 7 to 12						2,975	33
14 to 19	•	•	•	•	•	2,797	300
Oct. 19 to 24	•	•	•	•	•	,	
	•	•	•	•	•	2,490	100
26 to 31	•	•	•	•	۰	$2,\!517$	150
NO.							
July 19 to 24						2,615	
26 to 31	•	•	•	•	۰		
20 10 31	•	•	•	•	•	2,432	

Aug. 2 to 7					2,897	
30 to Sept.	4.				2,808	
Sept. 6 to 11		•	•		2,532	200
13 to 18			,		2,610	300
20 to 25					2,840	
27 to Oct. 7	7.				2,460	124
1876.						
July 3 to 8					2,967	
10 to 15					2,983	
17 to 22					2,308	
Aug. 7 to 12					2,827	
14 to 19		•			2,527	200
21 to 29	•				2,278	300
28 to 31					2,360	300

Q. (By Mr. Storrow.) I notice in the second column of each of these tables you have got an amount of "water ordered from

the reservoirs;" please explain what you mean by that.

A. The quantity in the first column is the total quantity running in the river for the average of twenty-four hours. In the second column is the quantity which we received from the reservoirs in New Hampshire, by orders; that is, a certain quantity is required to be run from the reservoirs in New Hampshire, steadily, which we call the natural flow from those water-sheds, and whenever more is wanted, we have to send orders for the specified amount, and that amount in cubic feet per second is started from that. In making this table, I have reckoned two days for that water to get to us.

Q. You have not put it in the day when it was ordered, but the

day when it got there?

A. Yes, sir; two days after it was ordered.

Q. Then I understand the first column represents the quantity actually flowing in the river?

A. Yes.

Q. And that the second column shows the amount stored up months previously, and now drawn from the storage reservoir where it has been stored?

A. Yes, sir.

Q. And after deducting the second column from the first, you would get the amount which the water-shed of the river furnished at that time, apart from the amount which you had stored previously to this?

A. Yes, sir.

Q. (By Commissioner Russell.) I understand there is a continual flow from those reservoirs, supposed to be equal to the current yield of their water-shed?

A. Yes, sir.

Q. (By Mr. Storrow.) Are those reservoirs situated on the Essex Company's water-shed?

A. Yes, sir.

Q. So that the use of that reservoir does not increase the total amount of water coming into the water-shed?

A. No, sir.

Q. And only affects the distribution by holding it back in time of flood, and pouring it out in time of drought?

A. Yes, sir.

- Mr. Butler. I propose a simple objection, Mr. Storrow. You say the only reservoir you have is the one in New Hampshire?
- Mr. Storrow. No, sir; it is the Winnipiseogee reservoir which he is speaking of now; it is the one in which the water is stored up in times of flood, and drawn out in times of drought.

Mr. Butler. I didn't understand you had two?

Mr. Storrow. Well, we have what we call the New Hampshire reservoirs, consisting of the great lake Winnipiseogee and many smaller lakes and ponds, all of which we control, and on all of which we own the outlet.

Q. (By Mr. Storrow.) This quantity, as I understand it, includes all that comes from all those New Hampshire reservoirs?

A. Yes, sir.

Mr. Butler. If it is convenient, we will call it the Winnipi-seogee reservoir.

Mr. Storrow. We always call it the New Hampshire reser-

voirs.

(By Mr. Storrow.) It represents the quantity which has been stored up in, and which is drawn from, those New Hampshire reservoirs, in addition to the ordinary supply which those lakes would naturally furnish without the gates and dams at the outlet, which we control under the charter of the Winnepiseogee Lake Cotton Manufacturing Company, which I read this morning.

A. Yes, sir.

Mr. Abbott. In this second paper you have here every week where the flow per second was less than 3,000 cubic feet?

Mr. Storrow. Yes, sir.

Q. (By Mr. Storrow.) And on all the weeks other than those here mentioned the flow of the river averaged above 3,000 feet a second?

A. Yes, sir.

Mr. Butler. 3,000 or over.

Mr. Storrow. Whereas the first paper, No. 1, shows the average per month for all the summer months, those where it was over

as well as those where it was under 3,000.

I believe that the commissioners understand the tables. I will make sure that they do. The amount named in the first column in each table is the quantity actually flowing, without regard to the second column; that the second column represents the stored up quantity which is drawn from the reservoir and comes to the dam on the dates stated; and deducting the second column from the first would give you, at any time, the amount which the water-shed would furnish without the storage, but including the ordinary and natural use of the Lake Winnipiseogee water which is within, and the shed of which forms part of our New Hampshire shed.

Q. (By Mr. Storrow.) Now I will ask you, Mr. Mills, how thoroughly you are satisfied of the correctness of those tables and what is the limit of possible error in them; and state, if you please, so that the commissioners may understand it, how you prepared them. I will ask you at the outset, whether these tables are the result of observations which you have made yourself as engineer of the Essex Company, or of your assistants, made under

your immediate supervision?

A. They were made by my direction. We make daily measurements of the quantity of water which is used during the working hours of the day by the mills; in addition to that, and sometimes while the mills are working, generally I may say, there is water running over the dam, during the day. Very commonly for the first two or three hours of the evening, there is low water at the place where we observe our lower gauge, as the quantity decreases after the mills are stopped until they start again the next morning; and then it increases, and in order to determine this quantity which is used at hours other than working hours, as well as during working hours, I have had a gauge kept of the height of the river below the mills, down below the end of the canal. This diagram illustrates the actual heights of the water at that spot as shown by that gauge for the last two months, and illustrates the way in which the surface of the water rises and falls there.

Q. That gauge is placed at a point in the river where all the water of the river passes, both that which is wasted over the dam and that which is used by the mills, so that its height is affected by

the actual and total amount passing?

A. Yes, sir. The lower line here in the diagram would be the zero of our gauge; these heights of $1\frac{1}{2}$, 2, 3, 4, 5 and 6 feet, etc., are represented by the spaces running across the diagram, and in the distances in this direction lengthwise of the diagram, the spaces represent one hour each, that on which I put my finger being 12 o'clock at night, and then 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, up to 12 o'clock at noon. Now the bed of the river there is in the neighborhood of 2 on our scale of heights, that is the bed that controls the quantity of water at a comparatively low stage of the river; there is a slight bar in the bed of the river, about half a mile below this place. Taking it at 6 o'clock in the morning, there is the height of the water, on this day, which happens to be July 20th; it starts with the water at 3.39.

Q. (By Mr. Butler.) Three feet and 39 above what?

A. It is the zero of our scale of height, and that zero I think is about high tide down at Haverhill. Our water at this place never gets below the point on which I put my finger, for the bed of the river is about 2 on this scale. Then this curved line represents the heights of water taken every half hour through the twenty-four hours. It rises rapidly up to 4.6 on this side at 7 o'clock; then again it rises rapidly, not so rapidly, but more than through the day generally, and at 8 o'clock on this day it was $4\frac{84}{100}$ feet on the scale; then it rises more gradually up to 12 o'clock, when the mills stop for dinner, and then it drops in this case about 6 inches. It rises again about as high as before and continues rising through the

afternoon, up to 6 o'clock; then the mills stop and it falls, as shown by this line, and keeps on falling generally until 6 o'clock the next morning. The bar that controls this height at the low stages is below the mouth of the Spicket river, about half a mile, so that this height would be the same the other side of the Spicket.

Q. (By Gen. Butler.) This shows the amount of water flow-

ing in the Spicket?

A. No, sir; it shows the height of the Merrimack river.

Q. (By Gen. Butler.) The height of the Merrimack river plus the Spicket?

A. No, sir; the height of the surface of the water — the actual

surface of the water.

Q. (By Mr. Storrow.) The raceways of the Everett Mills, and some other mills, empty all their water into the Spicket, and the height of this gauge is affected by that Merrimack-river water delivered through the Spicket?

Q. (By Gen. BUTLER.) Whether it includes the Spicket river? Mr. Storrow. Yes, sir. We mean that this gauge is placed near the end of the canal where the Spicket flows into the Merrimack, and its height is affected by the Spicket water so far as that

has any disturbing effect.

A. This gauge is affected also by the quantity which comes from the Spicket. There is a broad area there of about half a mile where the water is about level, and this is the height of that water; and the Spicket river comes just below the gauge into that area.

Now, the general character of this line of water-surface — of these heights of water — is illustrated by this diagram through these different months.

Q. How long a time is that diagram for?

A. During the last two months.

Q. (By Mr. Commissioner Russell.) Have you tables for

any other time?

A. I have. This diagram shows the height of the water every half-hour, except where there are certain changes during the twenty-four hours. Now, during the last six years, we have taken a gauge at this place opposite the end of the canal; we have taken the heights of the water there for the working hours only generally, and the heights by this gauge at ten o'clock A. M. have been taken there also by the company ever since they started. During the year 1875 and the past year measurements have been made, during the larger part of the time, of the actual quantity of water passing our dam and through our mills. They were made in 1875 and in the present year.

Q. (By Mr. Storrow.) You mean independent and actual measures of the water itself, apart from and in addition to the

observations of this gauge?

A. Yes. That going through our canals and that going over the dam. They were made in 1875 and in the present year.

Q. (By Mr. Abbott.) Beginning at what time in 1875, and running down to what time?

A. As soon as the ice went out in 1875. During 1875 these

quantities by actual measurement were taken during the working hours of the day, and at 9 o'clock in the evening, and at half-past 5 in the morning, at the same point, so as to determine thereby the quantity passing through the twenty-four hours; and these that I have just spoken of as made during the last two months are carried closer to each other, and are made every half-hour as a refinement of the measurement.

Q. (By Commissioner Russell.) These are for the last two

months?

A. These are for the last two months. During 1875, from the 20th of April.

Q. (By Commissioner Francis.) Half-past 5, you said?
A. Half-past 5 in the morning, and half-past 9 at night.

Q. And during the working hours?

A. Yes, sir.

Q. Half-past 9 at night?

A. Some were taken at 9 and some at 9.30.

Q. (By Mr. Storrow.) During the whole day?

A. During the whole season. Here you will see the relation of the difference between the quantity going in the daytime and that in the night. During a time of high water, as you will see from the diagram, when there is a large quantity of water going over the dam, the quantity running in the daytime is but slightly increased.

Q. Slightly increased over that running at night?

A. Over that running at night. Whether the mills use or do not use in high water makes but little difference in the height below, because the water running over the dam is slightly reduced by the draught for the mills, so that the quantity is lessened there, but the quantity below is increased by the same amount coming from the mills.

Q. In other words, when there is high water you cannot store it in the night for use by day, and that is the reason there is no

substantial change between day and night?

- A. Yes, sir. This diagram illustrates the condition during the different hours of the day, and from these observations I have determined, under the various circumstances, and taking those days when the river was about stationary, the relations of the height of the 10 o'clock gauge to the height of the gauge during the twenty-four hours, and in that way have deduced, running through the twenty-four hours, that the quantity for the whole twenty-four hours corresponds to the different heights taken at 10 o'clock in the river below.
- Q. If I understand you, then, in the first place, you find by actual measurement that the gauge varies during the day and varies during the night according to a certain rule or measure of variation which you ascertain by observing it, and then you find that these curves which express this variation are precisely identical or very similar with those which express the variations on the day after?
- A. With about the same volume of flow of water the curves are very nearly alike on different days.

Q. And you find that on a certain day when the curve for the twenty-four hours was thus, and so that the gauge was at a certain point at 10 o'clock?

A. Yes, sir.

Q. And you find that on other days when the gauge was the same for all half-hours of the day and night that it was at the same point at 10 o'clock as on the previous day?

A. Or at some other point very near it.

Q. And thus you know that the height of the gauge at 10 o'clock bears a certain relation to the height of the river at the other parts of the day?

A. Yes, sir.

Q. You ascertain in the first place, by actual measurement, the amount which was passing at each half-hour during the day, or at more frequent intervals, by actual measurement of the water, and thus you ascertain the total amount passing during the day. You observe at the same time the lower gauge at the moment of each observation, and you know that the observed height corresponds to, and indicates the passage of, the amount ascertained by measurement at that moment. Then, knowing by experience that the half-hourly oscillations follow a rule which you have learned by experience, so that the ten-o'clock gauge will enable you to deduce the other gauges of the day from it, you know that the height of the ten-o'clock gauge corresponds to and indicates a certain total amount passing through the day — not that the quantity momentarily corresponding to the ten-o'clock gauge is the average of the day, but that that height has some known relation to the total of the day, and therefore to the average per second of the day?

A. Yes, sir.

Q. And therefore, having ascertained by physical measurements of the water what that relation is, then, by knowing what the height of the water is at ten o'clock, you can deduce what amount during the day corresponds with that ten-o'clock height of the gauge for a day when you have an observation of the gauge, but no actual measurement of the water?

A. Yes, sir.

Q. (By Mr. Butler.) In other words, you take the relation of the ten-o'clock gauge to the total of the water as a uniformity?

A. Yes, sir. Now, without any reference to the ten-o'clock gauge, but from the various measurements of the quantity of water taken during the twenty-four hours during the past year and in 1875, I have determined the quantity of water that passes for different heights at this gauge at the time of observation whenever the river is steady, when it is not rising or falling, and that quantity is represented by this curve. The quantity of water flowing in the Merrimack river below our works at Lawrence upon the lower locks reads as in the margin, giving the quantity in feet per second. This actual quantity, that is laid down here and forms this curve, is taken from some 150 or 200 observations on different days.

Q. (By Mr. Storrow.) You don't mean merely observations,

but different measurements?

A. Yes, sir; different measurements on different days, for the quantities, accompanied by simultaneous observations of the corresponding heights. These measurements vary somewhat, coming from different days, and this curve is the mean of them all. These figures and the spaces in this direction are the heights of the river gauge corresponding to the quantities flowing by the dam, which quantities I ascertained by the 150 or 200 measurements.

Q. (By Mr. Hodges.) And whenever it is at that gauge then

these curves represent the amount, no matter what day it is?

A. Yes, sir. This curve represents the quantity of water flowing for twenty-four hours, when the 10-o'clock gauge at the lower

locks reads as in the margin.

Q. (By Mr. Storrow.) One of these curves is the actual quantity at the instant, and one is the average quantity for the whole day. One is the result of the calculation for that instant, and one is the result of the calculation for the whole day. That is a table

to interpret the 10-o'clock gauge by?

A. When the water is above 6.50 there is always water running over the dam, and this height, the height of 10 o'clock, is sensibly constant for the whole twenty-four hours, when that quantity is running, no matter what we are drawing through the mills within the limits of our draught, at Lawrence; but when the river is lower than that the relation between the 10-o'clock gauge and the total for the day depends upon the quantity of water that we are drawing through the mills. That is, the 10-o'clock gauge is not so much above the average for the twenty-four hours, if we are drawing a small quantity, as it is if we are drawing a large quantity. We run it up quicker in the morning, and run it up higher, also, if we are running a large quantity through the mills than if we are running a small quantity.

Q. That is, if I understand, the rule is not precisely the same at low-water stages, when you are using small amounts at the mills, as when with the same amount in the river you are using a

large amount through the mills?

A. Yes, sir.

Q. And you have ascertained by actual measurements what the rule is when you are using smaller, and what it is when you are

using the larger quantities?

A. Yes, sir. These different lines represent the quantities when 120 mill-powers are running, or 130 or 140 or 150, and also for 150 mill-powers with the head-gates of our canal closed at

night.

- Q. Then I understand that the rule which you derive from your actual measurements of water as compared with your observations does not give you an amount of water flowing in the river absolutely and at all times, shown by the height of that gauge alone, but that the relation between the amount flowing in the river and the height of that guage is also affected by a second cause in the low-water stages, which is the amount running through the mills, used at the mills?
 - A. Yes.
 - Q. And that your daily observations extend not merely to the

height of the gauge but also to the water running through the mills?

A. Yes, sir.

Q. So that the two elements which enable you to pass from the gauge to the average flow are the height of the gauge and the amount used in the mills?

A. Yes, sir.

Q. And both of these elements are the subject of observation and have been used by you in arriving at your results presented in your curves, and in your tables?

A. Yes, sir.

Q. And these curves show the complex rule depending upon both of those elements?

A. Yes, sir.

Q. (By Commissioner Stevens.) This only applies to the heights of 5 feet?

A. That secondary curve applies to all the heights where it is

needed or affects the results.

Q. (By Mr. Storrow.) Now I understand these diagrams which you have just shown us are the result particularly of these 150 to 200 actual measurements and experiments such as you have just described to us?

A. Yes, sir.

Q. (By Mr. BUTLER.) Made during what time?

A. 1875 and 76.

Q. (By Mr. Storrow.) And that by means of these actual measurements to compare them by you were enabled to pass from a certain height given by the gauge and a certain number of mill-powers used in the day; that you were enabled to ascertain from those observations of those two data the amount of water passing in the river?

A. Yes, sir; under the ordinary condition of the water as we

found it there during the past two years.

Q. So that by these rules, if I may use the expression, represented by these curves which were arrived at by actual measurements and observations during the past two years, you have been enabled to go back to your 10-o'clock gauge to see what water was flowing in the river?

A. Within certain limits during the past six years.

Q. During the past six years, I understand, from actual observations?

A. Yes, sir.

Q. (By Mr. Butler.) That is to say, assuming that so many mill-powers have been used on a given day?

Mr. Storrow. — No, no.

Mr. BUTLER. — Then, taking the 10-o'clock gauge as the constant quantity under certain circumstances, he gave that as the index of what that was, and he calculates backwards and finds out how much water was passing.

Mr. Storrow. — Taking the rule as constant and the gauge as the variable.

Q. (By Mr. Storrow.) How about the Spicket water coming

in and affecting the height of the gauge? I want to ask you, in making those tables, whether you have taken the measurements of the Merrimack river water, or whether you have included it in these actual measurements of the water in the Spicket river?

A. The quantity of water included merely the water passing

our dam above the point where the Spicket water comes in.

Q. That includes what goes from the Everett Mills? A. Yes, sir.

Q. So that your observations and your rules apply to Merrimacriver water and give the quantity of Merrimac river water which passes at Lawrence?

A. They give the quantity of Merrimac-river water which

passes at Lawrence and the heights of this gauge.

Q. Now I will ask you something about the size of the Spicket river, whether it largely affects the gauge or not?

A. It does affect the gauge.

Q. To what extent?

A. It is included in this. The height of the gauge is taken when the Spicket is coming in, and it is also taken when the

Spicket is coming in on the day when we measure.

Q. (By Mr. Hodges.) Has it to do with your measurements of the power? I understand your measurements of the power presented here is the power contained in the Merrimack above the Spicket?

A. Yes, sir; always.

Q. (By Mr. Butler.) That is to say, you throw out the effect upon the gauge of the Spicket river proper, what comes down the Spicket river from Methuen, and throw out that as an immaterial element?

A. No, sir. We include it. We include it in this way. It would be really immaterial upon the assumption, or nearly this assumption, that the quantity furnished by the Spicket varied, directly and uniformly, with the quantity going into the Merrimack, that is, when there is a small quantity coming into the Merrimack there is a correspondingly small quantity in the Spicket. great variation in the relations between the two would be different from the assumption, but the actual quantity measured above is the quantity that comes in the Merrimack; the height compared with below is the height made by the two.

Q. But that measurement is determined by the quantity?

No, sir; the measurement is not determined by the gauge. The measurement is determined by the quantity going over the dam, and the quantity going through our canals.

Q. And the steadiness of the flow at other hours is determined

by your quantity?

A. No, sir.

Q. (By Mr. Abbott.) The gauge indicates both the Spicket and Merrimack; then you connect with the height on the gauge made from both Spicket and Merrimack, but have the absolute measurement of the river, and you find that that height on the gauge, made up of Spicket and Merrimack, indicates from actual

measurements so much in the river above, that is, in the Merrimack alone?

A. Yes, sir; that is it.

Q. Then, if there should be any great deviation at any time between the Spicket and the Merrimack that would cause confusion?

- A. That does not destroy it; there may be such variation. When that is the case these observations are taken whenever we can get a steady condition of the river. Now, the quantity and height correspond to these varying conditions and the mean of these varying conditions is taken and represented by the diagram.
- Q. (By Mr. Storrow.) That is, you know the state of the gauge at every occasion. You actually measure the water of the Merrimack river falling over the dam, and the water passing into

canal?

- A. Yes, sir.
- Q. So that you know when the Merrimack flows a certain volume, what is the height of the gauge in the Merrimack below the canal and near the mouth of the Spicket?
 - A. Yes, sir.
- Q. Then you know, from these 150 to 200 observations, that the flow at that point corresponds to a certain height of the gauge which is placed in the Merrimack opposite or near the mouth of the Spicket?
 - A. Yes.
- Q. And then, knowing for a series of years the height of that gauge and the amount passing from the mills at low stages of the water, you were able to go back from that and ascertain the amount which comes from the Essex Co.'s pond by wastage over their dam and use in the mill?
 - A. Yes, sir.
- Mr. Butler. Knowing the amount flowing over the dam and how the gauge stands at different hours of the day, by means of the gauge, he determines that that quantity does pass through all of them.
 - Mr. Storrow. That is not it at all.
- Q. Now I come to another question, Mr. Mills. To go a little further, if the Spicket bore an invariable relation to the Merrimack, the fact of the gauge being affected by the Spicket would not affect the result of your calculations at all?
 - A. No.
- Q. It is only when the condition of the Spicket varies extraordinarily from the condition of the Merrimack, departs, to a large extent, from its ordinary relation, that that element disturbs your results?
 - A. Yes, sir.
- Q (By Commissioner Russell.) From its natural condition. That is, when the Merrimack swells the Spicket swells, and when the Merrimack falls the Spicket falls?
- A. Yes, sir; but if the Spicket rose or fell without the Merrimack then, to a certain extent, it would be some disturbance.
- Q. (By Mr. Storrow.) Taking into view that fact and all the other possibilities of error in your calculations, I want to know

how confident you are and what you can state as to the limit of

error beyond which the possible error will not go.

A. I found days immediately after a storm when there was a difference between the measured quantity and the quantity as indicated by the diagrams of 10 per cent.

Q. And how many such days did you find?

A. I found very few of them; two or three days.

Q. Two or three days in the course of a series of years?

A. Yes, sir; and during these observations of the last two

years.

- Q. Now I will ask you, with all the allowance made for these and every other cause of error which you can ascertain, what is the possible limit of error in the figures which you have presented in these two tables?
- A. Of course there may be a possible limit of that 10 per cent. That is the greatest which I have ever found.

Q. Upon any occasion?

A. Upon any occasion. I regard these as being within five per cent., but there have been days on which the variation is as great

as ten per cent.

Q. But you are satisfied that five per cent. is the utmost limit of error in these tables as they are made? I don't mean to ask for any particular day, but I mean to ask as affecting these figures in I understand there may be particular days in the these tables. year when there is an error of 10 per cent.

A. For the quantities of 3,000 feet, the greatest percentage I have found is 4 per cent. I have found it 4 per cent. each way.

Q. Sometimes one way, sometimes the other?

A. Yes, sir.

Q. And how often has that happened; is that a constant or a frequent error, or a rare error?

A. I should regard it as a rare difference?

Q. It has happened?

A. It has happened, and in presenting these quantities I should not claim for them a closeness greater than 5 per cent. That would be a fair presentation, I think, of the tables.

Q. (By Commissioner Francis.) Below 3,000 feet, 5 per cent.?

A. Yes, sir.

Q. (By Mr. Storrow.) I understand you to say that the error you have found in 3,000 feet was 4 per cent., sometimes in one direction and sometimes in the other?

A. Yes, sir.

Q. So that you could not say whether the total error of 4 per cent. ought to swell the figures or to diminish them 4 per cent.?

A. No, sir; they are intended to be a fair presentation of the

quantity.

Q. I will ask you whether you know of the flow of any other river of a considerable size being measured with any more accuracy than these figures present?

 Λ . I know of none.

Q. Whether you would have any hesitation as an engineer in

advising persons to build mills or construct works based on the accuracy of these figures?

A. I should have no hesitation in advising them, that works

should be constructed on these measurements.

Q. These tables which have been put in, cover from the beginning of 1871 to the present time?

A. Yes, sir.

Q. I want to ask you if you have made any comparisons in order to ascertain whether those years were wetter years or otherwise, as compared with the previous dozen or fifteen years; and if so, state the results? Tell me how they compare with the amount of the rainfall on the Essex Company's water-shed during those previous years? State the result of any examination which

you have made on that subject?

A. The comparison I have made is this: — Taking the rainfall for Lawrence, Lowell, Lake Village in New Hampshire, and the Weir's Landing in New Hampshire, and the Cochituate Lake records, I find in five years, 1871 to 1875, the average rainfall for the year at these different places was $43\frac{13}{100}$ inches; and that for the different records taken at these places, which have been taken for nineteen to twenty-seven years, the average is $44\frac{89}{100}$. That is, I took all the rain gauges I had, which were taken at these different places.

Q. (By Mr. Hodges.) Prior to 1871?

A. No, sir; including the whole time from 1871 back.

Q. Two in New Hampshire?

A. Yes, sir.

Mr. Abbott. That includes, Mr. Chairman, the average of these five last years also.

Commissioner Russell. Yes, sir.

Q. (By Mr. Storrow.) I understand that the average of these nineteen to twenty-seven years from 1876 back is $44\frac{89}{100}$, and the last five years is $43\frac{13}{100}$.

A. Yes, sir.

Q. So that the last five years is less than the average of the whole?

A. Yes, sir.

Q. And leaving out the last five years, taking the average of the previous years, that would be somewhat higher?

A. Yes, sir.

Q. (By Commissioner Francis). The inference is that the last 5 years were below the average?

A. Yes, sir.

Q. (By Mr. Storrow.) These tables which you have put in show the total amount of water, or rather indicate the total amount of water passing in the twenty-four hours, and state the amount which would pass each second, if that total was equally distributed through the whole twenty-four hours. Am I right in that?

A. Yes.

Q. Now I wish you would state whether the water of the Merrimack river does come to the Essex Company's dam at Lawrence

in an equal amount for every second of the twenty-four hours, or

whether it varies every second for the twenty-four hours?

A It does not come in equal quantities throughout the whole twenty-four hours, and the proportion varies with the different heights of river. When a very large quantity is flowing in the river it is more nearly constant during the twenty-four hours.

Q. Take a quantity of about 2,400 feet a second?

A. During the summer, with quantities equivalent to an average of 2,400 feet a second, I have found it comes about in this way; 4,200 cubic feet a second about twelve hours of the day, and about 600 cubic feet a second for the other twelve hours in the night. When there are 2,400 cubic feet of water running in the river, upon the average, for twenty four hours, it would give to us 4,200 feet for twelve hours the day, and 600 feet for the twelve hours of the night.

Q. Tell me how you know. You say "would give" that; how

do you know it comes that way?

A. We find it comes that way by our measurements. Q. You know it does come that way?

A. Yes, sir.

Q. Now I will ask you with water coming that way, equivalent to an average flow of 2,400 cubic feet a second, for the twentyfour hours, and coming, as it does come to you, 4,200 cubic feet a second for the working hours, and 600 —

Commissioner Francis. He has not said which twelve hours. WITNESS. I have said there were 4,200 cubic feet during twelve hours, and 600 cubic feet during twelve hours.

Q. (By Mr. Storrow). Which twelve hours do you mean?

A. The time when the largest quantity comes is from eight in

the morning until eight at night.

Q. Now when the water comes in that condition which you have stated, 4,200 feet a second during the twelve day-hours, from eight in the morning until eight at night, and 600 feet a second during the night, I want to know whether by the Essex Works at Lawrence the Essex Company are enabled to concentrate the whole of that water into the twelve working hours during which the mills are worked at Lawrence, say from half-past six in the morning until half-past six at night?

A. The works do enable it to be used with a certain loss of head

from the pond to the river below.

Q. That is, with a certain loss of head, by drawing down the mill pond to a certain point, you can concentrate all that water so as to use 4,800 feet per second from 6.30 in the morning until 6.30 at night?

A. Yes, sir.

Q. And have nothing running to waste at night?

A. Yes, sir.

Q. And if you can concentrate it into 12 hours, I assume you can concentrate it into 14 hours with less loss of head.

A. Yes, sir.

Q. And how about concentrating it into 16 hours?

A. It can be concentrated into 16 hours with less loss of head.

Mr. Butler. That is by drawing on the pond enough during the day you can do this?

Mr. Storrow. Yes.

- Q. Now, taking the definition of a mill-power, which is in the Essex Co.'s indentures, state how many mill-powers you can supply by a judicious use of the dam at Lawrence from 6.30 in the morning till 6.30 at night, when the river is furnishing 4,200 feet a second from 8 A. M. to 8 P. M., and 600 feet per second during the other 12 hours, making due allowance for the amount of head which you may lose by drawing down the pond to enable you to concentrate the water?
 - A. The whole being used in 12 hours, I understand you.

Q. Yes, sir.

A. 186 mill-powers.

Q. That is, allowing for the loss of head in consequence of drawing down the pond as much as required in consequence of concentrating?

A. Yes, sir.

Q. Now, I will ask you, on making the same allowance, how many mill-powers you can supply, to be used fourteen hours a day, under the same circumstances?

A. I have not made a calculation of that.

Q. Can you give me sixteen hours?

A. 145 mill-powers; and fourteen hours would be nearly half-way between.

~ \tilde{Q} . Will you tell me what is the fall available at Lawrence under the circumstances I have mentioned, when you concentrate all that water into sixteen hours a day?

A. It would be 30 feet fall.

Q. Tell me how many cubic feet per second would be required for a mill-power with that fall?

A. 24.8 cubic feet per second with a 30 feet fall.

Q. That was when you concentrated it into twelve hours?

A. That was sixteen hours.

Q. When you concentrate it into twelve hours, how many feet would be the fall under the same circumstances?

A. 28.9.

Q. And how many cubic feet per second does it take for a mill-power under those circumstances?

A. 25.6.

Q. Please go back and go over those figures again?

- A. With 2,400 cubic feet of water per second through the twenty-four hours, this can be concentrated and used in twelve hours as it ordinarily comes to us at Lawrence, giving us 186 mill-powers.
 - Q. With how much head?

A. With a fall of 28.9 feet.

Q. And how many cubic feet of water per power?

A. The quantity for a mill-power being 25.6 feet of water.

Q. Now take it for the sixteen hours?

A. The number of mill-powers is 145, the fall is thirty feet, and the quantity per mill-power 24.8 cubic feet.

[Adjourned till 11 A. M. Tuesday, Sept. 12th, 1876.]

Boston, Sept. 12, 1876.

The hearing was resumed at 11 o'clock, A.M.

Mr. Storrow. — I now put in, sir, all the charters, papers and statutes which I read and referred to yesterday.

Charles S. Storrow. — Sworn.

Q. (By Mr. J. J. Storrow.) Mr. Storrow, please state your

profession and present occupation?

A. Civil Engineer by education and profession. I have been thirty years or more, from the origin of the Essex Co., its treasurer and chief manager.

Q. Whether, or not, the Essex Co., under the charter which we

put in, built a dam?

A. They did. Commenced and finished it under my direction. Q. When was it finished?

A. In the year 1848.

- Q. And can you state, in round numbers, the cost, without being precisely accurate, of the dam and the canals — both canals?
- A. The dam cost about \$250,000, and the north canal and its gates and weir about the same amount, about \$250,000.

Q. And the south canal?

- A. The south canal \$150,000 in round numbers as far as now finished, as it stands.
- Q. Now I will ask you how many mill-powers you can use, or what the capacity of the north canal enables you to draw through it.
- A. We have had 145 or more running through it. We have not sold that number. I don't mean used by the mills, but have been passed through the canals.

Q. I will ask you about the capacity of the south canal; how many mill-powers or what proportion it bears to the north canal?

- A. The south canal was constructed with a view to utilize about two-thirds of the amount used on the north canal; the headgates are exactly two-thirds of the size of those on the north
- Q. I will ask you now about the ability of the Essex Co. to extend the length of the south canal in case they want more area for mill-sites between the canal and the river?
- A. The Essex Co. own the land, and can extend, at their pleasure, the south canal nearly a mile beyond where it now terminates.

Q. The land terminates at what point?

- A. The Shawshine River. They own all the land for a considerable distance back from the Merrimac River, far back, far inland from the canal.
- Q. Without regard to the expense of extending or building a canal, whether the head-gates which are now built would need to be changed or enlarged if you had occasion to extend that canal?

A. Not at all. The head-gates were made for the use of that whole canal, and at the canal where it now terminates is placed a cut-off, a water-tight partition, so that the canal can be extended a thousand feet, two thousand feet, or three thousand feet, as might be required, without interfering with its use as a full canal, as it now stands.

Q. And about the expense of the gates, as compared with the or-

dinary work of the rest of the canal?

A. It is very much larger, of course; it is difficult and dangerous work, especially as those head-gates had to be put in a good many years after the dam had been built and the water raised, and there-

fore had to be put in against the water of the river.

Q. I will ask you now whether the Essex Co. spent money in New Hampshire in improving the water-power of the Merrimack River, under the charter of the Winnepiseogee Lake Cotton and Woollen Manufacturing Co., put in yesterday; and if so, how much they expended?

A. We did. The whole expenditure there was some \$500,000 or \$600,000; I cannot exactly say what proportion has been paid by the Essex Co. — perhaps \$200,000, that is, in round numbers.

The larger portion was paid by our associates at Lowell.

Q. Why did they pay a larger proportion? Had they any

large ownership in the property?

A. No; their ownership is the same, but they wanted the use of it long before we did, because their power was practically exhausted before we had sold more than a quarter part of ours, and so they paid more than half of the early payments. Now, the use is more nearly alike, but they have still use for more than we have. We own it in equal portions, and for a long time we have paid equally.

Mr. Storrow. I now put in the deeds of the ownership of the

land.

Mr. Butler. I should not care to trouble you to put those in.

Mr. Storrow. I offer deeds showing the ownership of the land described in the petition, which is substantially the land shown inside of the red lines, the original purchase of the land inside the red lines, and I ask your attention to the fact that the deeds which we have of the parcels where the two ends of the dam abut, and the river front above and below it, are without any restrictions, so that we have acquired by those the ordinary rights of riparian proprietors.

Mr. Butler. I understand the fact to be that you cannot flow

any higher than you do now.

Mr. Storrow. No, sir; that was a fixed point under our charter, and it is established forever. We cannot raise our dam any higher.

Q. And I will ask you whether all the flowage damages which have been claimed against you, have been settled and paid for?

A. Yes, sir; twenty-five years ago.

Q. I will ask you to state, in general terms to the commissioners, what river-front you own on the south side of the river now?

A. You mean how far we have sold?

- Q. What have you sold on the river-front from the dam down to the Shawshine?
 - A. On the south side?
 Q. On the south side?
- A. We have sold simply what is marked on this plan; perhaps 800 or 900 feet; those three or four little small sites.

Q. Not over a thousand feet in all?

- A. I think not. I think not so much as a thousand. Let me see, I can tell you. Not more than 600 feet I think front on the south side.
- Q. I will ask you now how much land you still own on the south side of the river and have for sale?

A. In round numbers, some 600 acres.

Q. And can you point out about where it is on this plan?

- A. We own the whole of that front on the river where the canal is to be extended. We own that square next but one below Union street; the square next below Union street being sold to the Eastern Railroad for a station. We own the whole of this other square. We own two-thirds of the next square, a portion being taken by the Boston & Maine Railroad for a station; and, in general, we own pretty much all that region east of a north and south line drawn through the mill-sites sold, and also west of Broadway.
- Q. That is, you have sold out some land lying near the end of the river-bridge and the new mills, a circle about there, and some scattered lots beyond it.

A. We have sold land there.

Q. About how many acres have you sold?

A. I think we called it, some years ago, about 800 acres that we owned, and we perhaps have 600 now, and that is perhaps as near as I can give it to you.

Q. And the land which you have sold, as I understand, centres

chiefly about the railroad station?

A. About the railroad station and those little mills.

Q. Who has had charge of the sale of land and water-power by the Essex Co.?

A. I have had charge always.

Q. Now I will ask you how many mill-powers you have sold under the form of indenture which is marked "C.S.S.1?"

A. One hundred and two.

Commissioner Russell. It is marked "form of indenture used for 102 mill-powers sold prior to first of January, 1865, on north canal."

Q. (By Commissioner Francis.) Is this all on the north canal?

A. Yes, sir; these were all on the north canal, and they were

all that were sold anywhere prior to January 1, 1865.

Q. (By Mr. Storrow.) And how many mill-powers have you sold under the paper marked "C.S.S.2," which is marked "form of indentures used for seven mill-powers sold on south canal, adopted September 28, 1866"?

A. Seven. I may state there is one slight difference in those

indentures where we sold to some small companies, where we allowed them to put up wooden mills, and the larger companies were restricted to brick; some petty paper-mills and others had a clause allowing them to use wood.

Mr. Butler. That is, all the mill-powers are not the same

size?

Mr. Storrow. They are all the same size.

WITNESS. The same definition. That article is unchanged.

Q. (By Mr. Storrow.) How many mill powers have you sold under the form of indenture marked "C.S.S.3," marked "form of indentures used for 13 mill powers, sold Oct 1st, 1869, on north canal, article 16?"

A. Thirteen.

Q. I will ask you now whether the mills at Lawrence holding their waterpower under the Essex Co. have used and paid you for the use of surplus water under and according to the terms of the paper "C.S.S.4," marked "regulations for the use of surplus water-power, adopted Sept. 7th, 1870?"

A. Yes, sir; for surplus power under the regulations; prior to

that time no account had been taken of surplus power.

Q. (By Mr. Butler.) What is that?

A. Prior to that time no charges had been made for surplus power.

Commissioner Francis.—What date is it?

Mr. Storrow.—The date is Sept. 7th, 1870. You will observe that this is about the time that Mr. Mills came to the Essex Co.

- Q. Will you state how much you have received during the last five years for the use of surplus power in the mills at Lawrence under the regulations, Exhibit C.S.S.4?
- A. During the five years, January 1st, 1871, to January 1st, 1876, have received as the aggregate of that five years \$219,447 for the use of surplus water-power.

Q. Under these regulations?A. Under these regulations.

Q. Can you also tell me, or have you prepared a table which shows for each quarter during that period the amount of surplus power that was used, stating it, if you please, not exactly how much was used on each day, but what average through the quarter the amount actually used was equivalent to.

A. I hold here a paper showing the average daily use of surplus mill-powers for each quarter, from January 1st, 1871, to January

1st, 1876.

Q. And does the same paper also show the amount of money you have received during each quarter for the use of surplus

power?

A. The same paper shows the amount of money received each quarter for the five years, that is from the commencement of our charges for surplus power. Before that time we had taken no account of it.

Commissioner Russell.—The paper is marked "C.S.S.5," "Essex Co., surplus power sold in 5 years."

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Q. (By Mr. Storrow.) I will ask you to read and explain the

remarks which are in the last column on that page?

A. The remark here, "amount received by the Essex Co. for surplus power in five years, \$219,447," being an average for one year, for each year, \$43,849.40. The average of the whole used was 19.955 mill-powers, which I call 20 mill-powers. The average used for all that time was 20 surplus mill-powers; 20 mill-powers, at the rate of \$2194 a year, would produce just that amount; so that we actually received \$2,194 a year for each surplus mill-power That is to say, if those mill-powers were during those 5 years. rented for \$2194 a year for each, it would have given us exactly what we did receive. I further calculated that 36.57 mill-powers, at \$1200 a year, would have produced the same amount - 36. mill-powers, you may call it, would produce just the same amount. Thus, for the 5 consecutive years the Essex Company received for surplus power \$2194 per year for mill power, instead of \$1200, the price of permanent powers. \$2194 is 6 per cent. on a capital of \$36,577; and further, a mill-power used seven months, at the rate of \$2194 a year, produces \$1280; thus we have received as much for a temporary mill-power used 7 months, as for a permanent and leased mill-power used 12 months, the rate for that being \$1200.

Q. Now I will ask you to state what, in your judgment, is the value of a mill-power to the Essex Company to be used on the premises, and under the terms and conditions expressed in the indentures, and then to state the reasons which led you to fix the value you mention; and I mean by my question to include the

whole value to the Essex Company in every aspect?

A. I consider the value to us, or what we receive as the compensation for the sale of a mill power at, I cannot fix it exactly, but perhaps a little short of, \$40,000 — between \$35,000 and \$40,000.

Mr. Butler. I want, when the advantage of the sale of lands

comes in, to object to that as too remote.

Mr. Storrow. It is going to come in now.

WITNESS This answer includes not merely the rental of the power but the advantage we derive from its use on the very spot where we sell it, and where we confine it to be used.

Q. (By Mr. Butler.) And that advantage you derived from

the sale of lands?

A. Yes, sir.

Mr. Butler. I object to that part of it.

Q. (By Mr. Storrow.). Now go on and state how you arrive at those figures; what leads you to state that amount?

Commissioner Russell. I don't know whether you will require a ruling upon that at this stage or not.

Mr. Storrow. I don't care for a ruling upon it now; it is a

question to be considered whether it is too remote or not.

Mr. Butler. I think it is too remote and speculative, because the same speculative value of lands can be realized by the use of steam power, or any other power, and it is a value made a matter of speculation. There have been times when the Essex Company

could not sell their lands for anything, and there were times when they could sell them for very large amounts, and there were times when they could sell them for very little, and therefore it is not a steady element which ought to be taken into consideration. It is an advantage which they derive in common with other people owning land in their neighborhood. If there is anything further about that, I can prove it. I think we may assume that all lands rise in the neighborhood, and this belongs as well to the other owners as to the Essex Company; and if that is an element of damage to be seized upon in favor of the Essex Company, I don't see why every other man who owns land in the neighborhood, and who has had his power taken away from him, cannot come in and file a claim for damages as well as the Essex Company; and where is it to stop? It is like damages that result from a new public work; when rail-roads were first built men came in and claimed for damages to their taverns by having a turnpike discontinued, and various matters of that sort arose; and the courts have invariably held that that was too remote and too speculative. If you take that into consideration, I shall want it to go into your report. If you don't take it into your consideration, then you will say that, and give them the advantage that you want to.

Commissioner Russell. I suppose the question will be what order ought to be taken on the objection raised as to the testi-

mony.

Mr. Merwin. I suppose there is no question but what this precise interrogatory is competent. In reference to the general question which Gen. Butler raises, I suppose the Commissioners will not pass upon that now.

Mr. Butler. I don't expect them to pass upon it now.

Commissioner Russell. I dont see how it would be possible to exclude the testimony if it is given in the shape of reasons for value; it would be then for us to determine whether we should give the same weight to these reasons in coming to a conclusion; and whether they should be mentioned in our report or not, would depend upon the question whether we are expected to set forth all the questions of law which are involved in the trial and our rulings upon them.

Mr. Abbott. I was going to suggest in reference to it that in your report, as brother Merwin acted with both of your associates in half a dozen cases, you could set forth in a paper annexed the grounds for allowing damages under certain circumstances, and, I suppose, in that way both parties would have all other legal

points raised without any trouble.

Commissioner Russell. Then we may understand it to be the request of both parties that we should set forth upon this specific question whether we have allowed as part of the damages the damage done to the value of the land held for purposes of sale by

the Essex Company.

Mr. Butler. That would not exactly be the way I should desire it to be stated. It strikes my mind in another way,—for the prospective value, which if they had the water they would make; it is not the damage done to the present value.

Commissioner Russell. I don't know whether Mr. Storrow meant to say that or not; of course he has not yet stated whether it is that allowance for which he claims the damage, or whether it is the present damage which is done to the value of their land, as it now stands, by the taking of the water, or the future damage; he has not yet stated that.

Mr. Storrow. I should say it is not the land which we are hereafter going to buy which will be injured, but the land we own

now.

Commissioner Russell. The question is, whether it is the present damage to the value of the land or the prospective. We expect in our report to state the question and our ruling.

Mr. Butler. Before we get through I will endeavor to bring it from Mr. Storrow exactly how these things are made up, and

then we can have the questions raised upon them.

Q. (By Mr. Storrow). Now, please go on and state the reasons which will lead to the conclusion that a mill-power at Lawrence is worth to the Essex Company from \$35,000 to \$40,000?

A. When we sell a mill-power, as we have done for many years past by our leases, we become entitled to \$1,200 a year rent, representing a capital of \$20,000. That is, solely for a right to draw the amount of water defined as a mill-power from our canal. As a necessary adjunct, and to enable them to use that power, they must have land through which that water producing the power is to come, and for which of course they pay us. In addition to that, it is almost inevitable that they want a certain amount of land for some out-houses connected with their concern. I speak there of the sale to the person who comes and treats with us for one mill-power. I can exemplify that by the very last sale we made of one mill-power to Mr. Thomas Greenbank, the last one that went into operation.

Q. That is one of these little mills?

A. That is one of these little mills which you saw on the south side. He treated with me for one mill-power, and agreed to pay \$1,200 a year rent for the power.

Q. Did he take it under one of those south side canal inden-

tures?

A. Precisely; it is one of those seven. Q. By that power you mean what?

A. I mean the right which is defined by that south side indenture. He purchased at the same time a lot of land on which to erect a mill, and use the power, for which he paid \$6,000; he also purchased, for a house lot for himself and for some of his operatives, another piece, for which he paid \$10,500. That single sale of that one power to that man, the last we made, gave us from him what is equivalent to \$36,500, and that is very much a specimen of the ordinary way; and that is exclusive of such value as we may make from sales to his overseers, and to the population he brings there, and to those who supply them.

Q. Now I will ask you to take the value of the Essex Company's south side lands, before they started to put the canal in, and the amount of sales you have made from the organization of

the company up to that present time, and then compare them with the value of those lands since you have opened your canal there, and the amount of sales you have made since that time?

Mr. Butler. That is open to the same objection.

Q. (By Mr. Storrow.) That is, to compare the values of the land and the briskness of the sales, from 1845 to 1865, when you determined to put a canal there, and during those 20 years, with the values of the sales from 1865 to the present time?

A. The amount of land sold on the South side from the begin-

ning of our operations in 1845 to the year 1860.

Q. (By Mr. Butler.) Will you give me the date of Mr.

Greenbank's sale?

A. I think it was some time in 1872. The land sales for many years on that side were but nominal, and I have not got with me an account of them prior to 1860; they were merged in with others, and they were a mere trifle; but I have made a table starting from the first of May, 1860, and coming down to the present time.

Mr. Butler. This table we object to as evidence; an objection that it is not evidence in itself, independent of the other objection.

Commissioner Russell. Then you object to the table?

Mr. Butler. I mean to object to the table as not being evidence, independent of the question that it is mere speculation and of remote value. I mean to say that their acts for a series of years are not evidence, and such acts of theirs for a series of years are not evidence.

Commissioner Russell. Not evidence of the values of lands

sold at different periods?

Mr. Merwin. We put this in as showing sales that have been made.

Mr. Storrow. Showing actual sales?

Mr. Merwin. The Court has held that that is the best evidence that we can furnish.

Commissioner Russell. Well, Gen. Butler, do you object to the offer to prove the sales as proving the value of the land, or do you object to proving the value of the land?

Mr. Butler. I object to both; I object to the effect of evi-

dence to prove the value of the land.

Commissioner Russell. That was your first objection.

Mr. Butler. It was; and then I object to the vehicle of proof, the manner of proof.

Commissioner Russell. The first objection I understand to

be the original objection which you took at the outset?

Mr. Butler. Yes, sir; and I also think it is not competent to prove the value of the land of the Essex Company by showing how they have sold it.

Commissioner Russell. It seems to me I must pass upon that

as a distinct question.

Mr. Butler. Yes, sir. Then I object to this method of proving it.

Commissioner Russell. What do I understand by method; that is, proving by this witness the value of the sales?

Mr. Butler. Proving by this witness from a copy of which he

can have personally no knowledge.

Mr. Storrow. He has already testified that he made the sales personally.

Q. (By Mr. Merwin.) Mr. Storrow, these sales were all made

personally by you, were they?

A. The deeds were all signed by me, and the price were all fixed by me.

Q. From what did you make that memorandum?

- A. From the books of the company in my possession.

 At the time these entries were made did you know
- Q. At the time these entries were made, did you know they were correct and true?

A. I did.

Q. That is, that the figures were correct at the time; you had a personal knowledge of them?

A. Yes, sir.

Q. And this memorandum, which you now produce, is a correct one?

A. Yes, sir.

Q. And you use it as a memorandum?

A. I use it as a memorandum to show the value —

Mr. Butler. Wait one moment, Mr. Storrow. There might be other books showing sales.

Mr. Storrow. I propose to put this in as a statement of the

whole of the sales during the period covered.

Mr. BUTLER. We don't care to argue the question. I am defining my objection, that is all I care for. I can argue it by and

by.

Commissioner Russell. If the value of the land is held to be competent, I suppose it is competent to prove it by the sales; and, if Mr. Storrow is the one who made the sales, he can refer to a table to refresh his recollection of the prices which were paid; and if, by referring to that table, he is able to refresh his recollection of the prices at which those sales were made, he can state them.

Witness. The object of this table was for me to see what the sales had been before laying out the canal on the south side, and to see what they had been subsequently, and to see if any marked

change had taken place.

During the five years, 1860, 1861, 1862, 1863 and 1864 the average sales on the south side were \$2,057.83 a year, the aggregate sales in five years were say \$10,300; that is, to the first of May, 1864. From the first of May, 1860, to the first of May, 1864, and during those five years, the valuation by the city assessors was not changed a dollar; it was \$297,850, the city assessors valuation of that land.

- Q. (By Mr. Storrow.) Now I will ask you whether, in your opinion, the valuation of the assessors during those years was correct?
 - Λ. It was high enough, sir; I had no reason to object to it. I

run from the first of May each year to the first of May succeeding, because that makes the financial year of the Essex Company, and it is also the date of taxation. Between the first of May, 1864, and the first of May, 1865, the south canal was determined upon and laid out. That year the Essex Company sold \$18,668.81 worth of land, and the assessors raised the valuation to \$391,550; and the following year, from 1865 to 1866, the work of the canal was fairly begun, some \$25,000 was spent towards it; the sales of land were \$29,258.04. The next year the work of the canal was in full progress, and three mill-powers were sold in advance; they could not be furnished, because the canal was not built; they were contracted for. The next year the land sold was \$34,642.04. farther state that, when we sold a site on which to build a mill, we don't call that a land sale, that is a water-power sale; its price goes into our water-power account; these land sales which I am stating are exclusive of that. The next year between 1867 and 1868, the canal was completed, and the water was let in; completed as far as it now stands, and we sold \$45,987.12.

Q. (By Mr. Somerby.) What of?

A. Land. During the following years, from May, 1868, to May, 1869, Davis & Taylor's mill went into operation with one more mill-power, and we sold \$96,963.26. The next year, from May, 1869 to May, 1870, there was no change in the canal or mills, we The next year, between May, 1870, and May, sold \$43,090.56. 1871, a second mill went into operation, with one more mill-power, that was the Munroe mill, we sold \$25,089.37. The next year, from May, 1871, to May, 1872, there was no change in the millpowers, the land sold for \$77,816.45. The next year, from May, 1872, to May, 1873, the Union mill, Greenbank's mill, and Arnold's mill were built, and two mill-powers sold. Arnold was a man who got into difficulty and the mill was built, but was never run, and the sales for the year were \$124,153.41. The next year, from May, 1873, to May, 1874, the Union mill and Greenbank's went into operation, they were erected the year before, and this year they went into operation, and we sold \$28,054.06. These are the last sales of mill-power. The following year, ending May, 1875, the sales were \$7,365.34. In the year ending May, 1876, the sales were \$850; that is, for two years there has been a perfect stagnation.

Commissioner Russell. In holding that actual sales were admissible as proof of value, I meant to hold that proving the land sold, and what was realized from it, was proof of value of the parcels

of land sold.

Mr. Storrow. Suppose I now prove that all the land owned in 1860, in the opinion of this witness, was worth \$100.000, and during the years since that time he has realized about \$250,000, and what he has left is worth, in his opinion, \$200,000?

Mr. Butler. The difficulty I find is this, that it don't appear at all that this land was sold at any higher price in 1875 or in 1876, when \$800 worth was sold, than in any one of those years. I should infer from this that there was a stated price fixed for

men to come and take as they choose, and how that shows an enhanced value, I cannot conceive.

Commissioner Russell. I don't understand that Mr. Storrow proposed to show an enhanced value, but simply that he proposed to show the value of the land which the Essex Company owned, or the value of the land which was affected by their water supply. Now, Mr. Storrow is undoubtedly competent as an expert as to the value of lands at any particular period, where it can be proved by proving the sales at any particular period; but to prove the sales, you must show what is sold as well as what is realized from it.

Mr. Butler. I take it the land was worth something, so that this was not all clear gain by improved mill-power, and I should say if the land was going to increase in future, then by the sales they had only impoverished themselves so much. I think when they put in the value of the land what the land sold for, showing

an increased price per foot, then it is not evidence at all.

Mr. Storrow. We have already put in the fact that the Essex Company, in 1845, owned the tract pointed out on the map amounting to eight hundred acres; then since that time they have sold two hundred acres, and they have got about six hundred left, and he has pointed out on the map what we had originally, and what has been sold since. I don't mean definitely by metes and bounds, but substantially by the location. Now, we propose to show what the value of the whole eight hundred acres was before the two hundred was sold. We propose to show the value, in the opinion of the witness, of the six hundred acres which are left, and it seems to us that that would tend to show an increase of the value in this property during these years, and it will be a question for you to consider how far that is, and how far that is not attributable to the use of water on that canal, a part of which is withdrawn by the taking of Sudbury river. We say that the rise in value was coincident with the beginning of the water works on that side.

Commissioner Russell. When you speak of proving the value of land, I supposed you intended to prove sales in the ordinary

way, showing what was sold, and what it realized.

Mr. Storrow. That can be done if necessary. Of course it would be a long operation to show the sales of lots making up 200 acres.

Witness. I can state this decidedly that they are not the most valuable parts of our land. Our policy has been to sell rather outside the nucleus, and let that get the benefit of its surroundings. You saw the other day in your view when I took you round that the houses were mainly built a distance off, and the centre is much less built upon as it is much less sold.

Mr. Butler. As this has gone in up to this time, not followed by the amount which any land brought, any given piece of land,

showing any rise of value, it is wholly irrelevant.

Commissioner Russell. It may be useful in connection with what Mr. Storrow proposes to give to show what the value is and what is left.

Mr. Butler. But this evidence is not the usual way for him to give his opinion as an expert.

Mr. Storrow. Now I propose to go a little further and to ask him, in the first place, with regard to the lots which he has sold, whether the value of those lots, the prices at which those lots have been sold, have exceeded what in his opinion was the value of the same lots in 1863.

Q. (By Mr. Storrow.) Whether the price, at which these lots have been sold have exceeded or fallen short of the value of the same in 1863. What, in your opinion, was the value of the same lots in the spring of 1863?

A. They have exceeded the value of 1863 enormously.

Mr. Butler. In 1863 there was only \$259.00 of land sales. Q. (By Mr. Storrow.) Will you state now how much the lue of the lots which the Essex Company owned on the south

value of the lots which the Essex Company owned on the south side of the canal, in 1863, is greater at present than it was in 1863, making your answer include the same parcels of land? I mean to compare the value of the land which the Essex Company owned in 1863, with the present value of the same land, including both what you have sold and what you have still.

A. There is no question that the same land unsold now is at

least four times as valuable as it was in 1863.

Q. My question goes beyond that; I want you to state the value of the lands which you owned in 1863 at the present time. State the present value of all the lands which you owned in 1863, as compared with the value of the same parcels in 1863, whether at the present time it is greater or less than it was then.

A. I say it is fourfold greater at least than it was in 1863. Commissioner Russell. Taking at the two dates, the same

parcels of land?

A. Yes, sir, taking the same parcels of land which was worth

\$400 an acre, I have sold at \$5,000 an acre.

Q. (By Mr. Storrow.) I ask you if the prices at which you have sold lands were higher during the sales of the last few years, than the value of those lands in the spring of 1863?

A. Very much larger; the moment the canal was projected and done, the price of everything else rose in my estimation and the

estimation of others; a great impulse was given.

Q. Please to state now how far, in your opinion, the value of the land on the south side is affected by having water-power to be used there.

Mr. Butler. I object to that question; it is not a question for

an expert.

Mr. Storrow. I can put it in another way if it is less objectionable. What has caused the rise in the value of lands in his opinion on the south side?

Mr. Butler. That is not competent.

Commissioner Russell. He may be asked what is the present

value and what he bases his opinion upon.

Mr. Storrow. You have stated the present value to be greater than it was in 1863; please give the reasons which led you to state it.

A. Because building the canal there gives a great demand for work where there was none before.

Mr. Butler. Mr. Chairman, you will understand that this all

goes in under my objection.

Q. (By Mr. Storrow.) Now, since the dam was completed the Essex Company have used the water-power created by it, or by selling or leasing it to others during the whole time.

A. Certainly; of course they have not used the whole of it. It was substantially finished in 1847, the last stone was put in in 1848; the water was let in in 1847, but it was not quite finished

Examination of this witness was postponed until counsel have further examined Mr. Mills, when it was understood he would be recalled and interrogated in reference to matters which he and Mr. Mills have knowledge of.

Cross-Examination.

- Q. (By Mr. Butler.) Mr. Storrow, I don't know but it sufficiently appears, but I will have it made a part of the record. You cannot raise the Merrimack river by your dam any higher than it is now?
 - A. No, sir.
- Q. That is by a restriction of your charter and the fixing of a point above which you cannot flow?

A. Yes, sir.

Q. You have no other storage basins except those in New Hampshire?

A. Our dam and those in New Hampshire.

Q. Between Hunt's Falls and your dam and those storage basins in New Hampshire?

A. No others, sir.

Q. Can you tell me how many days in the year the water was

not running over your dam since 1865?

A. I can't tell from recollection; I know it is a very rare thing for the water not to be running over the dam some time in the

Q. Then, since 1865 you have received more water into your

basin than it could store?

A. More than we desired to store. We could have stored more, perhaps.

Q. How?

A. By refraining from drawing from New Hampshire.

Q. Then you could have stored back in New Hampshire. Other than that, was there any way in which you could have stored more water?

A. No. sir.

Q. What have you rated the water-power of your river before 1872 as a permanent power?

A. Please repeat the question.

Q. Have you ever had a rating or estimate of the water-power of your dam as a permanent power?

Mr. Storrow. General, that is one of the questions I propose

to ask him in a further examination.

Mr. Butler. Then I will pass from all that class of topics.

Q. (By Mr. Butler.) You say before 1865 you have sold a hundred mill-powers. Those have been sold either by cash payment down, and a rent for the residue, which would make the whole payment at the rate of \$1,200 a year by letting.

A. No, sir; we have sold in two ways; to what we call the large companies like the Pacific mills, and others we have usually sold power for a certain amount of cash down, and in addition a

certain amount of rental reserved.

Q. That is the way?
A. That is the way.

Q. Reckoning that rent-charge, the whole would be equal to \$20,000, at six per cent. a year?

A. Yes, sir,

Q. How do you do it?

A. We sold for \$9,336 cash. That was the usual standard sale for large companies, and in addition a rental in which ordinary specie paying times would be about \$300 in gold, which we reckon at so many ounces of silver.

Q. Then you take \$9,336 in cash for mill-power, and \$300 in the then currency of the time. With this exception then you

reckoned a dollar to an ounce of silver at a certain value?

A. Yes, sir.

Q. And in war times it was a great deal more valuable than paper, and to-day it is twenty per cent. less than gold?

A. Yes, sir.

Q. Now, then, six per cent. on \$9,000 and \$300 rental would leave the estimated value of your mill-power at what?

A. Something like \$15,000.

Q. That was sales to the Atlantic and Pacific, and to the Bay State?

A. Yes, sir.

Q. And since those sales?

A. We have sold none on those terms, except to those large companies and the Pemberton, so that the Pacific, the Atlantic, and the Bay State and the Pemberton,—what we call the large companies—

Q. And that class of sales ceased in what year?

- A. The last we sold on those terms were sold in the year 1869, when we made an additional sale of those thirteen mill-powers.
- Q. I will come to that directly, but when you sold out your first mill-power to those three companies, that was the price?

A. Yes, sir; that was the standard.

- Q. What was the time when those terms ceased, the \$15,000?
- A. As I say, the last we sold on those terms we sold on the first of October, 1869, but prior to that time —

Q. Excuse me, you don't answer what I want you to.

A. As they were sold almost every year during that period of twenty-five years, I could hardly answer that question.

Q. Then you and I are at cross purposes, Mr. Storrow, evidently. You say you sold on the \$15,000 basis to the Pemberton

mills, to the Atlantic, to the Pacific, and to the Bay State; now the Washington?

A. Yes, and the Everett.

Q. Originally when they were founded?

A. When they were founded.

- Q. Now, what I want to know is, leaving any sales to those mills and the Everett mills out, when were those original sales made?
 - A. The first sales were made in 1846.

Q. When was the last?

- A. The last of those sales was made October, 1869. The last on that basis —
- Q. Pardon me, you don't answer me my question. I must go back again. Let me take one at a time. When was the sale made to the Pacific, the original sale?
 - A. To the best of my recollection, it was made in 1853.
 - Q. When was the sale made to the Atlantic?
 - A. The first sale to the Atlantic was made in 1846.
 - Q. When to the Bay State or Washington?
 - A. At the same time.
 - Q. When to the Pemberton?
- A. From my recollection it would be 1853, but I am not certain within a year or two.

Q. Now when to the Everett?

- A. The Everett did not buy originally of us, we sold to the Lawrence Machine Shop, which was sold out to the Everett.
- Q. Then we leave the Everett out. Now I have got the original sales made by you; the Pemberton Bay State, Atlantic and the Pacific, and those were all sold originally on the \$15,000 basis, reckoned as you told us?

A. The original ones were -

Mr. Butler: Stop right there; that is all I want to know; don't be anxious.

[Adjourned until 1.30 P. M.]

AFTERNOON SESSION.

Tuesday, Sept. 12th, 1.30 P. M.

Cross-examination of Charles S. Storrow. — Continued.

Q. (By Gen. Butler.) After you sold the mill-powers to other parties, did you change the rate of selling or letting your powers?

A. After the first sale which we made in 1846, we varied from time to time in selling to others, so that that was fixed as a standard and was the standard of the last sales between the sales in 1846 and the sales in 1869.

Q. What were the limits of variation?

A. Well, there was one instance when we sold two mill-powers without any cash payment.

Q. But required how much rent?

A. The same rent.

Q. (By Commissioner Stevens.) What do you mean by "the same rent"?

A. The \$300 that was then payable.

- Q. (By Gen. Butler.) What two mill-powers were they?
- A. I think those were two that were sold to the Duck mill and the original Pemberton mills at the time of the great depreciation, our desire being to induce somebody to come there and use the water; but there were some variations in each company which had bought at six or eight different times one was the Washington mills; their original purchase was the standard price. There has never has been any change in rent.

Q. What is the highest price for which you have sold mill-

powers?

Q. The highest price has been our present price; that is \$1,200 a year in money, and that has been the price for all the powers sold on the south canal and all sold on the north canal in currency rates.

Q. How many powers did you sell in 1869?

A. In 1869 we sold thirteen powers which were mentioned, and we sold to old companies who took ten of them at the highest price those companies had ever paid, and the others at \$1,200 a year, to newer companies.

Q. How small an amount of a mill-power have you sold to any

one company?

- A. There is a single case of one-sixth of a mill-power; several cases of one-third.
- Q. Do you mean that is the smallest amount any particular person has bought altogether, or a particular sale?

A. There is one party who has bought a sixth, and owns a

sixth; others up to thirty-six mill-powers.

- Q. Have all those been sold within the limits which you have named either \$1,200, or the other limit?
- A. I named just now some which had been sold for the rent of the mill-power. We have made sales almost yearly since 1846.

Q. How lately have you sold a mill-power?

- A. The last I sold was, I think, in 1868; no, 1872. We have sold nothing since then.
- A. Was that a single mill-power? How much did you get for that?

A. It was the Greenbank mill-power; \$1,200 a year.

Q. Then I observe that your mill-power was sold to use sixteen hours a day. Does that limit of time continue?

A. It does, sir.

Q. What proportion of the operatives in your mill should you say were women, and persons under the age of twenty-one?

A. Oh, I could not say. Q. Well, guess; one-half?

A. I should think more than one-half.

Q. What time do you actually run in Lawrence?

A. Sixty hours a week under the law.

Q. Under the law, requiring that no female, or any person un-

der the age of twenty-one shall work only so many hours per week?

A. Yes, but there is this exception; there are some little paper

mills that run all night.

Q. So that really the privilege now to the mill-power is only eight or ten hours a day?

A. Yes, practically.

Q. That is, running about 11½ hours a day, and then only enough on Saturday to make up the sixty hours. So, practically, it is ten hours a day. I suppose, Mr. Storrow, your opinion is that that restriction has diminished the value of the water-power of Lawrence?

A. Not for the purposes of sale.

Q. How is it for the purposes of using?

A. I don't know about that. Some persons have thought that they could get as much work in ten hours a day, as they could in twelve; but I have no means of knowing.

Q. Now as to the surplus power which you have given us; I observe by looking at the table that you make a different rate of

charges. What is that rate of charge?

A. We allow each company to use up to a certain amount at the rate of \$4 a day, which is, practically, \$1,200 a year. Beyond that, we have two rates higher.

Q. What is that certain amount you allow each company to add

to their mill-power?

A. 20 per cent.

- Q. At the same rate?A. At the same rate.
- Q. And use it more or less days, as they please?

A. Yes, sir.

Q. If they use more than 20 per cent. how much will they pay?

A. \$12.

Q. Now, of this amount that you gave us on this paper, how much is there extra over that 20 per cent.?

A. I don't know from recollection.

Q. I wish you would get that and bring it in. Up to 1870 you

made no charge whatever?

- A. No, we did not. We had previously made arrangements and spent six or eight months in building structures to ascertain a mode of measurement.
- Q. You did not get into measuring to your own satisfaction until 1870?

A. No, we did not.

Q. So that practically up to 1870 there was no known measurement for your power?

Mr. Storrow. The witness did not say that. It is measurements of the water used by each particular mill that he is speaking of.

Witness. Knowing the whole quantity of the water flowing, and knowing that the whole quantity used was a great deal more than we sold, there was frequent complaint on my part to the companies that they were going far beyond their limits, and from time to

time I would go to one company or another — the Pacific or Atlantic — and say, "I know you are using three or four more mill-powers than you have a right to use; you must either cease using so much or buy more, and they bought more;" but they did not cease using too much. Soon the question of how much more they were using than they had a right to use rose. I had the water of each carefully measured. That was the occasion of these successive subsequent purchases. The Pacific had 8 originally, and now owns 36. The Pemberton began with 2, and owns 12. The Washington began with 8, and now owns 16, I think. The Everett began with 2, and now owns 10.

Q. In examining this case here [referring to document in hand], I find that in some years quite the largest amounts are used in

the dry season.

Mr. Storrow. The largest number of *powers*. That does not state the amount of water. A power is not a constant quantity of water. It depends upon the head of the fall.

Q. Well, I suppose the head in your power is determined by

the height of the water in the canal?

A. Comparatively.

Q. And the river below?
A. And the river below.

Q. What is the greatest difference that you have known in the height of the water in the canal when the mills had all been running?

A. There have been exceptional days when it has been, perhaps, two feet below the height; but the general run is a foot. Sometimes for months together there is no change.

Q. So that, practically, the head is the same?
A. The surface of the canal varies but little.

Q. And I suppose the head and fall is very much more affected by back water than in any other way?

A. Certainly.

Q. That is, you are affected more by too much water than by too little.

A. Yes, that is so.

Q. In your judgment, how much of the time — take one time, take the average of the year — how much of the year is there more water coming over your dam than you can draw through

your head-gates.

A. By far the greater part of the year there is more water coming than we actually do draw through the canal. If more machinery was run, we should use more; but, as it is, we check the capacity of the canal, and retain the water at about a certain height.

Q. But how much of the time? You have not quite answered my question. How much of the time of the year is there an actual

surplus going over more than your canal can carry?

A. As to how much there is more than the canal could carry, if we chose to drive it to its utmost capacity, I don't know, because the canal can carry sometimes very large quantities.

Q. I do not mean what can be carried and run over the wasteway, but I mean that can be used by the machinery.

A See if I understand your question.

Q. My question is this: How many days of the year, or what part of the year, will you tell me, more water runs in the Merrimack river than would be well used in your canal if you had machinery by which you could use it? I want to get at the time when you could use all this surplus water-power.

A. I cannot answer that.

Q. Half a year?

A. I should think for half a year.

Q. Two-thirds?

A. I cannot positively tell.

Q. Have you any such measurements of the amount of water

run that you can tell?

- A. When the water is a little low, we measure and watch it a great deal closer. At other times we do not trouble ourselves about it.
- Q. But you do not watch it more than six months of the year, do you?
- Å. Oh, we watch it every day; but we do not pay particular attention to measuring when the water is very high.
- Q. How many horse-power is a mill-power under your twenty-five feet head?
- A. A mill-power we commonly estimate at a very low rate at sixty horse-power. Theoretically, I think it is eighty-four; but, if a person wished to buy of me a mill-site, to run a mill which he said was to be sixty horse-power, I should sell him one which was theoretically eighty-four.

Q. That is to say, a mill-power over twenty-five feet, and varying above that; and six inches of water would be about one horse-

power?

A. That depends upon the quantity of water.

Q. 30 cubic feet a second over a 25 ft. fall is 60 horse-power?

A. Well, about 65 horse-power. That is the standard from which we vary up and down.

Q. How much horse-power per foot?

A. If 30 cubic feet give 60 horse-power, I suppose it would be 2 horse-power per foot. It is nearer 65, as, in fact, they use it, depending, of course, upon the goodness of the wheel.

Q. Yes, and it depends upon how high they have the gate, too.
A. Well, the better wheel a man has in, the more use he gets

from the water.

Q. I observe that Mr. Storrow, in opening the case said that the Essex Company, by their dam, had created a water-power. Do you agree with that?

A. I certainly do. By their dam they made a fall which fur-

nishes a water-power.

Q. Didn't they create more than that? Didn't they create a storage of water which they could use, running back 9 miles, 26 feet, in the summer?

- A. They created a fall by raising the dam, and the dam also creates a reservoir.
- Q. Do you believe that if the Merrimack river had no dam upon it and no reservoir, that anywhere near as much water would pass by Lawrence — leaving out the lake there — in the dry season as does now?
- A. If there was no machinery anywhere on the Merrimack river above Lawrence, the water would be lower in dry time.
- Q. So that the water would fall in the spring in large quantities, and run off in the early freshets, and in the summer those streams which were not dammed would be substantially dry?
- A. Of course, there would be more excessive quantities at one time, and a deficiency at others, if the usual amount was not
- utilized.
- Q. That is to say, the natural running of the river would be very much less than the artificial running as it runs now?
- A. I think, say twenty years ago, there was more fluctuation than there is now.
- Q. Have you any claim or right that you know of to have anybody's dam above you kept up for a single hour if they choose to take it down and let the water run?
- A. I don't know as we have any right, unless the law gives it to us.
- Q. Do you know of any other rights you have to have the water come down to you from anybody else who owns land on the border of the river?
- A. Unless some legal points may be involved, I do not. How far one man may interfere with another I really am not informed.
- Q. My point is not how much they interfere. My only question is, whether they cannot stop interfering if they want to?
- A. If the dam above was taken down we could not help ourselves.
- Q. And so of all the others clear up to the uttermost fall wherever there is any water. In fact, there are a great many reservoirs upon the Merrimack and its branches?

 - A. Yes.
 Q. You know some of them. The Nashua is the great one?
 - A. That at Lowell is the great one and Nashua.
- Q. But there are a great many reservoirs on the feeders of the Nashua — not only mill-dams, but storage-basins?
- A. Why, yes; men are endeavoring all the time to improve the water-power.
- Q. And there have been those improvements ever since you have known the water-power of the Merrimack?
- A. Yes, sir; and they have been increasing, so far as my observation extends, from year to year.
- Q. And haven't you seen a sensible effect down at Lawrence from that increase?
- A. I think the general tendency of things, independent of any operations of ours, has been to improve the water-power through the simultaneous and co-operative movements of all the millowners.

Q. Would you say that within twenty years in the dry season the water had increased — with the same rainfall — as much, or

more than ten per cent.?

A. I don't know as I could give any answer. Whenever we have examined our river, we have been surprised to find it so productive.

Q. Have you ever measured the water-shed of your river?

A. Only from the maps which we have in our office — not personally. It has been measured several times for us.

Q. Now, about these sales of lands: had it not been the habit of your company, in appraising the land which might be taken, and when buying land for building purposes, to fix the price?

A. The price of land was always fixed by me, personally, and, moreover, the prices have varied considerably at certain periods,

and at other times they have not.

Q. Now, what I desire to know is, whether you can give me a table of the prices at which men coming into your office could look when they took lands from time to time.

A. No; the prices were so different. They ranged all the way

from one cent to three dollars.

- Q. I agree to that; and that is exactly what I want to get at; I knew that.
- A. Land since we have been there has sold from one cent up to three dollars and over. But not the same land in the same place.

Q. Let us see. Did the Essex Company pay anything like one

cent a foot for any of the land?

A. Their original purchase was \$300,000, which covered 1,800 to 2,000 acres, at a pretty high price, some of it. After we started we bought little pieces about the town, and paid a high price to secure that portion. We bought the land before we created the water-power, with a view of creating the water-power.

Q. Oh, yes, I suppose you did. Take the land in the same locality and give me the price it sold for from year to year since

1849 — since the first sale. Take it at any sum.

A. I should say at that first sale we sold land on Essex street

for about thirty cents.

Q. You sold land here and there for so much, and then it went up, and then it went down?

A. No, sir; it never went down. We have never lowered our price.

Q. Well, if it went down it must have gone up.

A. As we kept on selling we got more for what was left; and if the less we have the more we have got, I don't know where we

shall end. I suppose I have sold 5,000 lots.

Q. Now, sir, didn't the prices of your land, from year to year, depend largely upon the prosperity of the general business of the community? Didn't the sale of your land depend largely, from year to year, upon the general prosperity of the general community?

A. It did; upon the manufacturing community.

Q. Now, do you not believe, Mr. Storrow, that the sale of your lands, and the profits derived from them, were caused by the

belief of the community that a large city would grow up around there.

A. No doubt.

Q. And that you had a large water-power.

A. No doubt.

Q. Which would —

A. No doubt.

Q. Do you believe there was any other cause than that?

A. It was a great manufacturing centre.

- Q. You haven't half exhausted your water-power, have you?
- A. Oh, yes; but not constantly. We look very much to Lowell. We know all their water comes to us, and that they use about the same as we do.

Q. How many mill-powers are they employing at Lowell?

A. 157, as a general thing, running up to 200 mill-powers.

We have sold at Lawrence 122 in all.

Q. Now, do you believe it would have altered the fact of the sale of them, had you known you had 20,000,000 of gallons less per day than you have got from the sale of them?

A. I don't think it would have.

Q. How many horse-power by steam do you employ?

- A. I am unable to answer. I know that the large companies have large steam engines, but they are not in constant use; they use them occasionally. I rather think one company has a large engine of 400 or 500 horse-power, which they do not use more than once or twice a year. That is to say, their steam-power is not much used.
 - Q. Isn't there a large quantity used in Lowell steam-power?

A. My impression is, that there is; but I don't know but there is a great deal more machinery run in Lowell.

Q. Practically, then, you supply power to whoever wants it for

about \$20 a horse-power a year?

A. Yes; \$1,200 a year; and large companies on the north canal and the small companies there likewise have been for years urging us to sell them more water-power, but we have refused.

Q. That is to say, the north side,—you refuse to have that side of the city use any more so far as you can prevent it by holding on to your water-power in order to have the other side use it. Then, after all, it was this growth that you have been telling us about which enabled you to make these large sales of land?

A. Naturally, having use of the water-power, we intended

to utilize our south side as well as the north.

- Q. But where there is a large population, you won't let them have any more water-power, but make them move on the other side where there is unoccupied land. That puts me in mind to ask you how much real estate your company owns in value at your price exclusive of the land?
 - A. It is hard to tell; but we are assessed at about \$750,000.
- Q. The assessment in some towns is very large, and in others very small. I am asking you now at the price you put here in your estimate, how much, in your judgment, real estate is held—leav-

ing out your canals, dams, etc., - to-day by the Essex Com-

pany?

A. I should say on the north side the value of our real estate to-day is about \$200,000. On the south side (I don't want you to tell the assessors), I shouldn't be surprised if we got a million.

Q. Then you hold \$1,200,000 of real estate?

A. It may produce that. Q. What is the capital stock?

A. \$500,000.

Q. What is its market value?

Mr. Merwin. Wait a moment. I don't see how that is material. [To the commissioners.] You may admit it subject to our objection.

Gen. Butler. I rather think I have a right to put in other

people's idea of its market value.

But not by hearsay. Mr. Merwin.

Commissioner Francis. Did he say what its market value

\$130 a share — perhaps something more. The capital has been \$1,500,000; but it has been successively reduced by refunding money to the stockholders, because it was no further needed in our enterprise, — it is one which has natural termination, except as regards the water-power.

Q. What was the State tax?

A. On a valuation of \$1,300,000.

Q. Have you seen or known of any diminution of water at Lawrence which you can attribute to the taking of the waters of the Sudbury river?

A. Not according to my observation. We have had a surplus

of water ever since the last taking.

Q. Doesn't Lowell, as a rule, begin drawing before you from the reservoir?

- A. As a general thing they do, for they have more power in use than we have; but there may be times when we use more than they do.
 - Q. And, of course, their water comes to you?

A. Of course.

Re-direct.

Q. (By Mr. Storrow.) How many years after the Essex Company was chartered before they made a dividend?

A. The Essex Company were twelve years without any dividend.

Q. When did they begin to pay their dividends?

A. I don't remember now. I think we were a dozen years without a dividend. Then we began to pay small ones. My impression is that up to this time we have not received our money at six per cent.

Q. Up to 1864 or '5 they varied considerably?

A. I think the dividends began in 1862. We made one dividend on expectations, and lost twelve on facts.

[Adjourned to Thursday, September 14th, at 9.30, A. M.]

THURSDAY, September 14, 1876.

Mr. Storrow. At the request of the city, we will admit as true, in 1856, the facts which are stated in the agreed statement of facts in the case of Heard vs. Talbot, 7th Gray, 113, except the first paragraph, and the paragraphs on the 16th page, which are peculiar to that case. We do not admit that those facts are material or competent in this case, nor that they are all the facts, but we admit that those facts are true.

Mr. Butler. To save time while we are waiting for the witness, I will read from the case of Heard vs. Talbot, as follows:—

"The Messrs. Talbot claim a right to now maintain their dam without payment of damages (even if the dam shall cause said lands to be flowed), by reason of the following acts and proceedings done and had by themselves and those under whom they claim.

"In 1708 the town of Billerica granted to one Richardson a certain tract of land, and a right to dam Concord river at the falls in that town, for the purposes of a grist-mill, so long as he or his heirs should furnish a mill there to grind the grain of the inhabitants of said town. In pursuance of said grant, a grist-mill, within a year or two of the grant, was erected there, with a dam of a certain height, which mill and dam and other mills were kept up and in operation till and since the incorporation of the proprietors of the Middlesex Canal, as hereinafter set forth. No forfeiture is claimed by the town of Billerica or by the complainant for any want of a grist-mill for the inhabitants.

"Certain persons were incorporated as 'the Proprietors of the Middlesex Canal,' by St. 1793, c. 21, for the purpose of cutting a canal to unite the water of the Merrimack river with the water of Medford river, with certain rights and privileges given them by

their charter.

"The proprietors in 1798 purchased said mill privileges on the Concord river, and erected a dam, as Mr. Heard alleges, to a greater height than the former dam, for the purpose of raising a head of water to supply their canal, using the surplus to operate their mills, the grist-mill having the first right.

"In 1804 they completed their canal from Merrimack river to Charles river, and opened it for public navigation, taking toll therefor, and using the head of water so raised in Concord river to feed their canal, and the surplus also to run their said mills.

"In 1798 the proprietors procured an additional act to be passed (St. 1798, c. 16), by which they were empowered to purchase and hold any mill-seats on the waters connected with their canal, and to erect mills thereon.

"Said proprietors rebuilt the grist-mill and mills for manufacturing lumber, and leased and sold water-power at said Billerica, from time to time, so long as they were in active operation as a canal company, to divers persons, to be drawn from the head of water raised by said dam, and always to be used in subordination to the use of the water for feeding the canal, except the grist-mill, which always had the first right to the use of the water.

"In 1826, finding their dam insufficient to raise the water for their purposes, said proprietors built a new and more permanent dam, in connection with the old one, which is the structure here

complained of.

"The proprietors carried on their canal, using in the dry seasons of the year all of the water of the river, for their various purposes and for the mills of those claiming under them, the canal using the largest part thereof and retaining the first right thereto, till the year 1851, when their canal was wholly disused by them and filled up in parts of it, and has become now wholly unfit for use, and is no longer filled with water, and is wholly unused by said proprietors.

"At the time of the abandonment of the use of their canal, and as a part of the winding up of their affairs, the proprietors sold all their land and the residue of the water-power by them unsold, raised by their dam aforesaid, to the Messrs. Talbot, by deed of quitclaim, 'subject expressly to the reservation of all easements and services necessary for or incident to the preservation and use of said canal for the purpose of navigation, and of all the rights of the public therein, until the same shall be lawfully discontinued;' and the Messrs. Talbot have since that sale maintained and kept up the water by said dam for manufacturing purposes, and claim to use the same in such manner and to such extent as may suit their convenience for such manufacturing purposes, subject to said reserved right of said canal.

"It is also agreed (if it be competent evidence) that after the abandonment of their canal said proprietors applied to the legislature for leave to wind up their affairs, and to sell their land and waterpower, and surrender their charter, which application was denied; and that afterwards they applied by petition to the Supreme Court for leave to wind up their affairs and surrender their charter, which petition is still pending; which applications were made after the

deed to the respondents.

"It is also agreed (if it be competent evidence) that the canal corporation, or those claiming under them, have never in fact paid any damages for flowing Mr. Heard's land, or obtained any grant or license therefor, except such as may be presumed by law from the lapse of time from the facts above stated."

Testimony of Hiram F. Mills, resumed, having been suspended, owing to the illness of the witness.

Q. (By Mr. Storrow.) Mr. Mills, will you state the area of the Essex Company's water-shed above the dam, as it existed in 1872, before the taking of the Sudbury river by the city, including the upper Sudbury-river area? Mr. Abbott. Does your question include all the water-shed, of

every description?

A. Yes, sir. From the best data I can find with regard to this subject, I find that there are 4,136 square miles of drainage area above the Essex Company's dam.

Q. Will you state the amount of drainage area of the upper

Sudbury, above the point where the city dam now is?

A. 72.3 square miles, as I make it.

Q. Have you gone over that upper Sudbury area yourself with a view to examine its character as a water-shed, and as compared with the rest of the Essex Company's water-shed of 4,136 miles; and if so, will you state what you ascertained, and your conclu-

sions in that respect?

A. I have been through this territory of 72.3 square miles for the purpose of getting at its general character as a water-shed. I have not been through the whole of the 4,136 square miles of the Essex Company's water-shed for this purpose; I have been through it a great many times, not with special reference to studying its character, but I did go through the 72.3 square miles to see whether there was anything exceptional in it, or anything by which I should regard it as less valuable or more valuable than the general character of the water-sheds in this area, and my conclusion is that it is as good as the general character of our water-sheds.

Q. State some of the facts which you observed which led you

to come to that conclusion.

Mr. BUTLER. We shall not put the character of the shed into contest, but the amount of water we shall. What I mean to say

is, that the character of one is as good as the other.

Q. Can you state, also, the area of the water-shed of the lower Sudbury; not the waters which drain through the Assabet into the Concord river at Concord, but the waters which drain into the Sudbury, above the Assabet? I want the area which drains into that stream between the city dam and the mouth of the Assabet. I understand that the 72.3 square miles which you have stated is the area of the upper Sudbury, above the point where the city dam is. Now, I want the area of the lower part of the Sudbury river, which drains into it at the place where the Assabet comes in and forms the Concord. The Assabet and Sudbury join at Concord, and the water of the two becomes the Concord river.

A. That area I have had calculated, and I find $62\frac{1}{2}$ square miles

by Borden's map.

Q. I will ask you now as to the comparative rainfall on that upper Sudbury area, as compared with the rainfall on the Essex Company's New Hampshire area, or with the rainfall on the rest

of the Essex Company's area?

A. The materials that I have had for comparing the rainfall of the different areas are the observations of nineteen years, at Lake Village and at Weir's Landing, near Lake Winnipiseogee, and the average of those nineteen years is 43.27 inches of rain yearly. That is, at these two places those gauges are about 4½ miles apart, and being so near together I took them together, or rather the average of the two, as forming one quantity. At Wolfboro' we have had

rain gauges taken for the last six years. That is at the other end of Lake Winnipiseogee, some thirty miles away, the average for six years is 39.27. We have two rain gauges on the other branch of the Merrimack, at Bristol and at Ashland. They have been taken for the last six years.

Mr. Abbott. Those have been exceptionally dry years.

Q. About how far are they from the Weirs?

A. I should think thirty miles. This is on the Pemigewasset branch. These have been taken for about six years. The rainfall at Bristol is 45.35; at Ashland, 45.79; average of the two together, 45.57. Then at Lowell there are two gauges, and at Lawrence one gauge.

Q. How long have they been kept?

A. The Locks and Canals gauge for twenty-one years; the Merrimack Manufacturing Company's for twenty-seven years. I say twenty-seven years; the results of these two gauges I took from the last city document, No. 80, of this year, and I do not know that this Lowell gauge has not been taken longer than twenty-seven years.

Q. How long has the gauge at Lawrence been taken?

A. For nineteen years.

Q. The average of those three is how much?

A. I will give the three in detail, as they show that they do not vary much. The Locks and Canals gauge, 45.71; Merrimack Manufacturing Company's, 43.77; and the Lawrence gauge, 43.16; making an average of 44.21. That is, dividing the sum of these three, it is 44.21.

Commissioner Francis. The average for one year is generally greater by one of these gauges than the other, — generally greater by the Locks and Canals gauge.

Mr. Abbott. You have no idea that there is any substantial

difference in the actual amount of rainfall?

Commissioner Francis. No, sir; the gauges are differently situated, and of a little different form. I think likely that the Merrimack Company get more rain than they did fifty years ago by taking more care in making the record, I suppose.

Q. Will you give the next gauge you have?

A. The next gauge I have is at Lake Cochituate. The average for twenty-four years given in the last report of the Water Board is 50.19. The mean of the four gauges is 44.50.

Q: Which is the nearest of those gauges to the Sudbury area?

A. The Lake Cochituate.

Q. That is close to the edge of the area, is it not?

A. Yes, sir.

Q. Will you state how you arrived at the quantities, 4,136 square miles, and 72.3 square miles, and whether the methods employed in the two cases were or were not the same?

A. The 72.3 was determined from Borden's map of the State of Massachusetts, by drawing a line as nearly as possible between

the divisions of the waters as shown on that map.

Q. And how was the rest of the Essex Company's area obtained?

- A. That part in Massachusetts was all obtained from Borden's map of the State. The part in New Hampshire was obtained from Carrigain's map of New Hampshire, and the nine county maps that contained part of the area, and the mean of the two results taken.
- Q. Will you state whether you have, in the course of your performance of your duties for the Essex Company, ascertained the comparative price of steam and water power, with a view to ascertain what price it was advisable for a mill to pay for waterpower, rather than start their engine, and if so, state the results which you arrived at, and whether you acted upon them? I do not ask you for the precise value, but the price at which you think there is no doubt it is better to use water than to start the engine which a mill has already.

A. I was going to say I could not give you the precise result, for I haven't it with me; but this conclusion I did arrive at, that it was better for the mills to pay \$12 a mill-power a day for their

water than to start their engines.

Q. How large engines have the Pacific got at Lawrence?

A. I think at the Central Pacific Mill they have one of about

1,000 horse-power.

Q. Whether or not, when they can use surplus water-power at an expense of \$12 a day, do they use that power or start the engines?

A. They have used the water-power in preference to starting

their engines.

Q. Invariably? I mean to confine my question, of course, to times when there is water that can be got, and when they can take the option whether they will take the water at \$12 a day or start

their engines?

A. I think they have been running their engine sometimes when they have been paying \$12 for water; but when they have had ample steam-engine capacity for all the surplus power they have drawn, they have bought water and paid \$12 for it, months together.

Q. And let their engine lay idle?

Q. (By Mr. Merwin.) That is, when they have had the election of paying \$12 or using their steam, they preferred to take the water-power at \$12?

A. Yes, sir; they have taken it.

Q. (By Mr. Butler.) Would \$12 a mill-power per day be

about \$60 a horse-power per year?

- A. That would be about \$45 a horse-power—at the rate the horse-power of a steam engine is generally reckoned—indicated horse-power.
- Q. (By Mr. Storrow.) You speak of "indicated horse-power, I understand, which is a very different thing from horse-power on the shaft?

A. It would be about \$60 for a horse-power on the shaft.

Mr. Abbott. That would be merely the daily expense of coal and service on the steam engine, without the expense of capital.

Q. (By Mr. Merwin.) Your estimate assumes that the steam

engine is already put in with all the appliances?

A. No; there is no assumption of anything. The question is, how much this \$12 a day would amount to per horse-power per year.

Q. And you say it is equivalent to \$60 a year on the shaft, and

about \$45 indicator power?

A. Yes, sir.

Commissioner Francis (to Mr. Storrow). This is not intended

to be the cost of a steam engine?

Mr. Storrow. No, sir; it is intended to show that the cost of steam-power is above that; that a man will pay that for water-power when he has a steam engine in.

Cross-examination by Mr. Butler.

Q. I suppose, Mr. Mills, that with an engine already put in, and in running order, with an engineer and fireman all ready under pay, which they must have, the only cost of using horse-power by steam would be the cost of coal, wear and tear of the engine, and oil and waste?

A. Those would be the principal items.

Q. Do you think of any other? — Oil — waste — coal — wear and tear of the engine?

A. Well, there would be the cost of the men engaged in running it.

Q. Pardon me. Do they not keep an engineer all the time?

A. Yes, sir.

- Q. Do they not keep a fireman, and keep steam in the boiler all the time?
- A. Not to the same extent. They have a fireman at work all the time.
- Q. Now, sir, what do you say it is worth to generate a horse-power of steam? Having the engine and all the appliances and fire under your boilers, what do you say it is worth per horse-power?

A. Oh, they don't have fire under the boilers in this case.

Q. Is there ever a time, in your judgment, that the Pacific Mills do not have fire under their boilers, or some of them?

A. They have under some of them, because they have use for that steam; but not under all of them.

Q. Suppose you confine yourself to my question, and leave other matters out: we shall get along better, I think. I want to get your judgment. My question is this: What, in your judgment, from your calculations, does it cost a year to make a horse-power of steam—the engine being already prepared, a portion of the boilers being heated, and an engineer and fireman to attend to a portion of the boilers?

A. I haven't the calculation here; but from what data I have

here, I conclude it would be not far from \$60 per annum.

Q. How many pounds of coal per day per horse-power?

A. I haven't got all my data here for the calculation, but this will give you some idea.

Q. My question was a very distinct one, Mr. Mills: How much coal it would take per day, or any other time, per horse-power?

- A. When their engines are in good condition, they use about three pounds of coal per hour per horse-power, at about seven dollars a ton.
 - Q. Is that a day of ten, twelve, or fifteen hours?

A. Ten hours.

Q. 30 pounds a day, 300 days a year, would make how much? A. 9,000 pounds; at seven dollars per ton, that would be \$30 for coal. I think that is about as low as they get it.

Q. Now, then, how much for oil?

A. I cannot tell. I haven't got any figures here.

Q. What other items did you put in, sir?

A. The engineer and fireman.

Q. How much do you make a day for them?

A. For a hundred horse-power engine, I suppose it would be

about \$15 a day.

Q. Would it cost any more for a thousand horse-power engine than it would for an engine of a hundred horse-power? Wouldn't an engineer tend one as well as the other, if it was a good engine?

A. You want a much better engineer.

- Q. A competent engineer could tend one as well as the other?
- A. Yes, sir; what I intended to say was, \$15 per horse-power per year. That is, \$1,500 per year for a hundred horse-power engine.

Q. That would be \$5 per day for the two?

A. Yes, sir. Q. What else?

A. There would be the depreciation of the engine from the

running, and the wear of the boiler.

Q. Now, as an engineer, I will put you this question: Which do you think would depreciate the most - an engine standing still or running?

A. There is more wear running than standing still.

Q. I know there is more wear; but which would depreciate the most, in your judgment, — an engine standing still three years or running three years?

A. An engine running.

Q. How much?

 \check{A} . I cannot tell you. Q. Now, will you tell me whether this engine is used most by the Pacific Mills when the water is too high or too low?

A. When it is too high; that is, when it is too high below the

mills; when the fall is the least.

- Q. When it is too high below the mills, it is generally too high above them, is it not?
 - A. No, sir; the water is kept at a constant height in the canal.
- Q. No; the water in the river is higher when there is a great flow of water?
 - A. Yes, sir.

Q. Did you ever know them to run it because they were short of

water unless you were repairing, or something of that sort?

A. No, sir, I have not. I think they did run it one time when they were short of water, because they hadn't wheel capacity; but they put in larger wheels so that they could run by them.

Q. Their water has never cost them, has it, more than \$15 a

horse-power?

A. Yes, sir; they pay \$12 a mill-power per day for a great deal of it.

Q. Have they since 1869?

A. Yes, sir; every year. Excuse me, I have made a mistake in saying "1869." They did not do it until 1870. Since the fall of 1870 they have paid \$12. Through 1870—that is, the latter half, from the 1st of October, 1870—'71, '72, '73, '74, and '75, I think; I am quite sure.

Q. In 1869, didn't they buy whatever mill-power they chose to

buy at \$15,000 a mill-power?

A. No, sir; they bought power in 1869. I don't remember the rate they paid for it.

Q. Didn't they buy what they chose to buy?

A. No, sir; I understood not. I was not in the employ of the Company at that time.

Q. How high up in New Hampshire did you begin to measure

your water-shed?

A. As far as it extends.

[Witness was about to refer to a map, when Mr. Butler said: — I object to your looking at a map, and insist upon having an answer to my question. I want to know where you began to measure your water-shed, if you know. If you don't know, say so.]

A. I began at the division of the waters, as shown on the map,

at the upper part of the drainage area.

Q. Where was that?

A. I cannot tell.

Q. Don't you know whether you began up in the White Mountains, or not?

A. The map will show that I made the drainage area from.

Q. Is the map at which you looked the map from which you made the drainage area?

A. No, sir.

Q. Then you cannot tell without looking at the map?

A. No, sir.

Q. Now, sir, can you tell me what streams you took in as feeders of the Merrimack?

A. No, sir.

Q. Any one of them?

A. All that are represented on those maps that I speak of.

Q. Can you tell me any one of them?

A. I don't know as I can give the names of them.

- Q. Can you tell me one of them in the whole distance down?
 A. Well, there was the I don't know what you intend to ask.
- Q. I want to know if you can tell me any one stream which you took in as a feeder of the Merrimack?

A. I took in the Pemigewasset and Contoocook branches.

Q. Any other?

A. I don't remember the names of them. Q. Did you take in the Nashua river?

A. Yes, sir, I took in the Nashua river.

Q. Any other?

A. The Concord. Q. Any other?

A. I took in Beaver brook.

Q. Any other?

A. I don't remember to call the names of them. Q. When did you do this?

A. During the last year.

Q. For the purposes of this case?

A. Yes, certainly.

Q. Now, sir, did you take in the lake water-shed area at Lake Winnepiseogee?

A. Yes.

Q. Did the map which you used show any of the reservoirs, or storage basins, of any stream until you got down to the Concord?

A. It had the lakes and ponds as they are represented on the

county maps, and on Carrigain's map of New Hampshire.

Q. Do you know whether those lakes had been made into reservoirs or not?

A. Some of them had.

Q. Do you know to what extent?

A. I don't know as to what extent, beyond that of the Lake

Company.

Q. I know; that I lay aside now. Did your map show the private reservoirs? What I mean is, reservoirs that were made, and were not natural ponds?

A. I don't remember of any. My attention was directed more

to the outlines of the drainage area in my examination.

Q. How were the outlines shown, sir?

A. By where the streams running in one direction stopped, and in cases where there were hills and mountains represented.

Q. By taking the streams running in one direction and the

other?

A. Yes, sir.

Q. Had you any evidence that those maps were taken from

actual surveys?

A. They are represented to be so. I think they are all represented to be taken from actual surveys. They are regarded as the best maps that we have of that territory.

Q. Now, then, when you came to the Concord did you take the

water-shed at all of the Assabet?

A. I have made an estimate of the water-shed of the Concord, including the whole.

Q. How much did you make that, — take it in the first instance,

at Billerica?

A. I haven't it at Billerica. I have the water-shed above the Wamesit dam at Lowell — 352 square miles. That includes everything down to the Wamesit dam, including the 73 square miles of

the Sudbury.

Q. That would make the water-shed of the Sudbury above the city's dam about one-fifth of the water-shed of the Concord river?

A. Yes, sir; $\frac{73}{352}$ of the total area.

- Q. Have you the water-shed of any other tributary of the Concord except the Assabet, so as to give me the distinct water-shed of those two streams?
- A. Nothing but what I have given you. Mr. Storrow asked me the drainage area of the upper Sudbury, and then of the lower Sudbury.

Q. Can you give us all the upper branches of the Sudbury and

the Concord?

A. The upper branches of the Concord are the Sudbury and the Assabet.

Q. The Assabet is formed of two rivers, is it not?

- A. I don't remember their names. I know there are two upper branches.
- Q. Then, there are quite a number of other streams, are there not?

A. Yes, sir.

Q. On which there are mill-powers — Black-brook river and Meadow brook?

A. Yes, sir.

Q. The Assabet has a number of reservoirs, has it not?

A. The Assabet has a number of mill-ponds.

Q. And reservoirs, too, has it not?

A. I don't know about its reservoirs, — about the amount they

have to draw upon for storage from spring to summer.

Q. Now, we are told something about this stream, and I will put you the same question I put to Mr. Storrow: Do you not believe that the water in the Merrimack is very largely increased by storage over what it would be if it ran in a state of nature,—the amount of water running in the dry months of summer?

A. During the months of August, September, and October, it is increased, I know, by the quantity that is drawn from the Lake Co.'s reservoirs; during the early months it may be increased by the quantity drawn from private reservoirs; but I should suppose

not to a large extent.

Q. Leaving out the Lake Co.'s reservoirs, if you please, as an engineer, do you not believe that storing up the water of the branches and feeders of the river, to be used during the working hours of the day, through the summer months, increases the flow during those months in the streams below?

A. It may, and may not. It may decidedly diminish them. It depends upon the way in which those reservoirs are used, and

the amount they can be drawn down.

Q. Using them as men naturally do who make reservoirs for

mill purposes, don't you think it increases it?

A. With such reservoirs as are made for this purpose, I suppose that the water that is carried over from the spring is run out and evaporated ordinarily as soon as the middle of July. After

that, I suppose the quantity of water flowing is likely to be

decreased on account of the reservoirs.

Q. You assume that the stored water is all used up before the middle of July, and then it takes more rain to fill up the reservoirs which have been drawn down, so that you do not get so much water down below?

A. No; that the water that is carried over from the spring is likely to be used up by that time, and that there is no advantage in them beyond the use of the amount which is carried over.

Q. Are there not, during the months of June and July, frequently large rains which would be an overflow in a state of nature,

which might be retained?

A. Yes, sir; but as much water, or more, would flow from those rains through the reservoirs through the summer months, if the reservoirs were not there, as if they were there.

Q. Available for power?

- A. It would depend upon the conditions under which it is used.
- Q. Without fencing about it, do you think a river would be as valuable for power without reservoirs up and down upon its streams, as with?

A. No, sir.

Q. Don't you think that every reservoir that is built on a feeder of the Merrimack river contributes to its effectiveness at Lawrence for water-power in the dry season?

A. I cannot say that.

Q. You cannot say whether it does or not?

- A. Not that all of them do. They may be used so as to be effective.
- Q. Pardon me. I do not assume that men make reservoirs for the purpose of not using them. I am speaking of reservoirs made and used as men of ordinary prudence and judgment spend their money and use their reservoirs. Now, do you or do you not believe, as an engineer, that those reservoirs are an advantage to the effective water-power at the Lawrence dam, and that a new one would add as much as it might?

A. As I said before, I have no doubt that these reservoirs increase the water flowing in the early part of the season. After that, they may be an advantage, or they may be a disadvantage.

Q. The early part of the season you put as the 15th of July?

A. Yes, sir, I put it at about that time.

- Q. Passing from that, Mr. Mills, as I have got your idea about it, will you tell me whether since you have been there you have been short of water?
- A. No, sir; we always have had a good deal more than we have sold.

Q. Then when you speak of surplus water you mean that which you have not theretofore sold?

A. We have sold to the companies a definite quantity of water. Whenever they use more than that, we charge each one with surplus water.

Q. It is the water which you, having in excess of what you

have sold for use, sell them above the definite quantity that you have sold?

A. We have sold them on the North canal a definite quantity, and refused to sell them more. They have applied for it very often. But we allow them to use temporarily water for which we charge them by the day, - and that is what we call surplus water.

Q. That is, — surplus in this, — in that it is water that you

have not sold them?

- A. Yes, sir.
- Q. What do you believe, from your knowledge of the river, to be the actual power of that great river, - its steady power, irrespective of any diminution by the city? Supposing the city had not taken any, and that it remained the same as it was before 1872, how many mill-powers was the capacity of that river to furnish steady power?

A. 2,400 cubic feet a second. Q. There were 25 feet fall?

- A. No, sir, we have greater fall than that. It would be for 24
- Q. I want you to tell me, not how many feet it would be per second every 24 hours, or how many feet per second there would be in the night-time, or in the daytime, - but I want you to tell me how much, in your judgment, is the capacity of that river at Lawrence to afford a steady power? State it in mill-powers or in horse-powers, as you have a fancy.

Mr. Storrow. What its actual practical capacity is?

Gen. Butler. I mean as the power is used in the manner that men ordinarily use power? I want to get rid of these refinements if I can. I want to know what effective power that river furnishes there?

A. 186 mill-powers.

Q. That, you think, is its full capacity?

A. I think that is the capacity that we can depend upon.

Q. That you can depend upon? A. Yes, sir.

- Q. Well, of course, that is the utmost capacity for steady power? That is the utmost capacity, as a power, that you would venture to sell, and guarantee the buyer power all the year?

A. Yes, sir.

Q. And no more?

A. That is all we could guarantee him.

Q. Would it make any difference whether that was used twelve hours or sixteen hours a day?

A. Yes, sir. Q. How much?

A. You ask for the quantity, as they are in the habit of using power. That was your question; and I answered it. Upon a use of that power during twelve hours; and if it is used a longer time -

Q. The 186 mill-powers were for twelve hours?

A. Yes, sir. If used a longer time, it would be a less quantity, and a less number of mill-powers. If used a shorter time, it would be more mill-powers.

Q. Is that irrespective of your idea about concentration of power, — which you talked about the other day?

A. It is the actual condition of things that we can control there

by our works.

Q. Is this with the aid of the lakes?

A. It is.

Q. How many mill-powers do they have at Lowell? How is their capacity?

A. I cannot tell.

Q. Have they not used as high as 200? A. Yes, sir, I have understood so.

Q. I mean in the dry season?

A. I am not sure.

Q. You have the Concord besides?

A. Yes, sir.

Q. And some other feeders? A. Yes, sir, some small ones.

Q. The Concord you rate at about ten mill-powers?

A. I don't know that I have ever made any estimate on it.

Q. I mean with a fall of 26 feet. Do you make that about ten mill-powers, taking the average of quantity that you have?

A. I have made no estimate of the flow.

Q. That is 600 horse-power?

A. I have made no estimate of the quantity.

- Q. 288 cubic feet per second was all it sold for on the Wamesit dam, as we have learned. That would be about 600 horse-power, would it not?
- A. Please state it again. I did not know that your statement was to be part of a question.

Q. 288 cubic feet per second on a 26-feet fall?

A. [After making a calculation], 288 cubic feet per second on

a fall of 26 feet would be ten mill-powers.

Q. That is as it has been rated. I wanted to get in the evidence of it. Before I quit this subject of "water-shed," for a moment, will you tell me whether you made these measurements for yourself, actually, of the maps?

A. No, sir, they were made from my direction.

Q. How much time did you spend on them? A. I cannot tell. I examined the maps in the neighborhood of the lines carefully to see whether I could make any change in them.

Q. Did you make the computations?A. I did not. I had them made twice, independently.

Q. You did not make them?

A. No, sir, I did not make them.

Q. How much of time during the last summer up to now has the water been running over the dam at Lawrence?

A. It has run over every day. I cannot tell you just how many hours.

Q. You tell us that by concentration of water-power, as it is called, you could store up the water that comes down, so as to use more of it. Could you use more of the amount that runs over the dam?

A. Yes, sir. Whenever there is 2,400 cubic feet of water coming, and no more, we can use it within the twelve hours.

Q. How much of the time is there 2,400 cubic feet per second

running, and only that?

- A. It is about twelve hours; but not the twelve working hours.
- Q. How much of the time is that amount, and only that amount, running?

A. About twelve hours.

Q. How many months in the year?

A. Well, I have found —

Mr. Merwin [interrupting]. That is all in the tables, General, is it not?

Mr. Storrow. The tables on pages 30 and 31 give all that.

A. [Consulting memorandum.] I have made a memorandum which I think covers just that exact question. There are five weeks during the past six years when we have not had that amount. During all of the other weeks—

Q. You mean 2,400 feet per second and upwards?

A. Yes, sir.

Q. Now, sir, about the storing of water, you have no capacity for storage beyond your present capacity, have you?

A. No, sir.

Q. Now, so long as a greater quantity of water comes down than you use, so long you have no capacity for storage?

A. We have our pond for storing. We have our mill-pond. Q. Undoubtedly; that is there all the time. That is a constant quantity.

A. After that is full, then there is no room for storage.

Q. And if more water comes down from Lowell, through the Merrimack and the Concord, than you are using day by day, then you have no capacity for storage?

A. We have capacity to store from one hour to another during

the day, — but not from day to day.

Q. Now, if I get your idea of what is called "concentration of water," it is that you might draw down, through a portion of the day, below the top of your dam, and let that fill up from the water which would come in during the night or during the rest of the day?

A. Yes, sir.

Q. Have you taken that into consideration in your 186 mill-powers?

A. Yes, sir.

Q. In making that storage, how much would you draw down

your head?

A. [After consulting memorandum book.] In the first hour and a half (we starting at half-past 6 in the morning, the water from Lowell not getting to us until about 8 o'clock), we would draw down the pond $\frac{870}{100}$ of a foot. Then, using during the day, — using more than comes from Lowell, — we should continue draw-

ing down to such an extent that at night we should be .87 of a foot lower than that.

Q. Two " 87 "?

A. Yes, sir.

Q. A foot and three-quarters?

A. Yes, sir.

Q. Very well; then you assume that it will fill up during the night? It is through that consumption that you are running 2,400 cubic feet and no more?

A. Running an average of 2,400. There is an average of 2,400

in twenty-four hours.

Q. You told us that in 2,400 feet per day you got 600 in the

night-time, and 4,200 in the day?

A. Yes, sir; or rather 600 during one twelve hours, and 4,200 daring the to her twelve hours. But that twelve hours does not begin with the starting of the mills. We do not get the 4,200 till 8 o'clock in the morning.

Q. That is, you get it dependent upon the time the water comes

down to you?

A. Yes, sir.

Q. And you really get that amount per day owing to the opening of the gates at Lowell and the letting out?

A. I suppose it depends largely upon that. Q. Don't it depend wholly upon that?

A. It depends also upon what may be running over their dam.

Q. Then you have more than 2,400 feet per second?

A. I think they do not generally use as much as 4,800 cubic feet per second during their working hours.

Q. But, in running over their dam, they use more water than

you do?

A. They do at present.

Q. If it is running over their dam besides this, you have got more than your flow of 2,400 feet per second, when it gets down to you?

A. Well, that does not follow necessarily.

Q. Don't it generally?

A. I was taking it as it is now. We are using less than they.

Q. I understand. They are using more than 2,400 feet per second, are they not, during working hours?

A. Yes, sir.

Q. They are using more than that, or else it would not be any storage at all. Well, now, I want to call your attention, — having got thus far, 600 in the night-time, when the reservoirs are closed, and 4,200 in the daytime, — using working hours when the reservoirs are open, don't you think on the whole the reservoirs will make some difference?

A. They certainly enabled the water to be used at the hours that it is desirable to use it.

Q. As an effective mill stream, the effective use is all you want of it, I take it?

A. Certainly. The water coming in this way enables us to use it during working hours to better advantage than we could otherwise.

Q. And if it came all day, or all the time, you could not use any considerable portion of it by your concentration, could you?

A. No, sir; it is an advantage from day to day; there is no

question about that.

Q. And you could not get this advantage of a change from hour to hour unless you had this advantage from day to day?

A. No, sir.
Q. Very well, then, it is an advantage both day by day and hour by hour?

Re-Direct.

Mr. Storrow. We put in by this witness "rain-diagrams," showing the amount and date of each shower during the six summer months, for six years, — since the beginning of 1871, — at Lake Cochituate, at Weir's, and at Lake Village in New Hampshire, and at Lowell, Mass., showing the times and the depth in inches of each shower. They show that a large rain fall frequently falls on one area, and none on the other, and vice versa.

Q. (By Mr. Storrow.) I will ask you in regard to one fact, which I believe has not been mentioned. From the drainage area, as you have given it, what proportion of the Essex Company's

whole water-shed is the upper Sudbury water-shed?

A. One fifty-seventh.

Q. You have said that if 2,400 feet per second (averaging that through the whole day) were running, you could concentrate that, with a certain amount of loss of head, into 186 powers; and if more were running, you could so concentrate it with a less amount of loss of head. If the flow during the day were represented by more than 2,400, and you desired to concentrate it, so as to enable you to use 186 mill-powers, would it require a greater or a less loss of head to enable you to concentrate it so as to get 186 powers?

A. A less loss of head.

Re-Cross.

Q. (By Gen. Butler.) I want to ask you how much rainfall in a shower in the middle of August, in a dry season, on the upper Sudbury, you think could be appreciated down at Lawrence by the finest instruments known to science?

A. I have not made a calculation in regard to that; but it

would have to be a very large one.

Q. How large? A. I cannot say.

Q. I want your opinion as an expert.

A. I have not considered the conditions sufficiently to give an

opinion.

- Q. Do you believe that three inches would make any earthly difference, that could be appreciated down there by any known in-
 - A. Yes, sir; no doubt it would make a very decided difference.

But whether we could tell whether that came from this quarter or

another quarter is a different matter.

Q. That is not the question I asked. I asked you this question: Assume a shower at the upper Sudbury river and nowhere else, of three inches, taking place yesterday, in a dry season, do you believe that there is any possible method of knowing whether that does or does not alter the flow of water, —practically, not theoretically, at Lawrence, —by any gauge or measure you can make?

A. I will see [makes calculation]. I think it would be pretty

close work to measure it; but nevertheless it could be done.

Q. Whether you should say, sir, from your examination of the water-shed of the whole Concord river, down to the Wamesit dam, assuming that no water was taken away by the city, in your judgment there would be more or less than 600 horse-power at Wamesit dam—26 feet fall? [Question repeated.] From your examination of the water-shed and rainfall of the Concord river, including the Sudbury river, assuming the fall at Wamesit to be 26 feet, should you think there would be more or less than 600 horse-power or 10 mill-powers?

A. I could not make such a conclusion without a great deal more examination than I have made, — and one could not be made with-

out a long series of observations on the matter.

Q. Couldn't you approximate, — whether there was more or less?
A. Is your question in regard to 24 hours, or 12 hours, — the 288 cubic feet?

Q. It is 24 hours.

- A. I should think there could not be realized that amount. It may come pretty near it; but as an approximation I should say that there would be likely to be less than 288 cubic feet for 24 hours.
- Q. Well, sir, could you approximate so as to tell whether there would be one-third more, so that you could say, "I know there will be not over one-third more"?
- A. [After making calculation.] I should think there would not be so much as 288.
- Q. Have you now got an opinion that you know there would not be one-third more?
 - A. It is my opinion that there would not be a third more.

Q. Not anything like it?

A. Yes, sir.

Q. Very well; that leads me to another question: 288 feet is 10 mill-powers. You have already testified that the water-shed of the upper Sudbury is one-fifth the water-shed of the Concord, and therefore one-fifth of the water-power. That, if there were 288 feet per second, would make the Sudbury at the Wamesit dam 2 mill-powers. It could not be any more, I take it; that water could not be at any more at the Essex dam than 2 mill-powers. It could not increase going down, but would diminish by evaporation. Now then, you make the water-shed of the Sudbury one fifty-seventh of the Essex Company's water-shed now 186 mill-powers. That would give considerable more, would

it not - or something like 3 mill-powers - for the Sudbury at Wamesit dam, in order to make that up?

A. Yes, sir; something like that.

- Q. Now, there would be a mistake somewhere, either that the water-shed of the Sudbury is not so large a proportion of your effective water-shed at Lawrence, or else there would be more than 288 cubic feet at Wamesit dam?
- A. There was a mistake in the question you asked me before. You asked me the number of mill-powers of 288 cubic feet, used 10 hours a day. You now speak of the same number used 24 hours.
 - Q. You assume storage?A. Yes, sir.

Q. Suppose there is no storage absolutely?

- A. It makes no difference in the general tenor of your question.
- Q. How much more than 288 feet do you think is used on the Concord per day? how much more is there to be used?

A. I don't know how it comes to you there.

- Q. It comes, as water generally does, running down hill. comes as it does come. Is there that amount of water running there from your water-shed, that is what I want to know?
- A. There is not 288 cubic feet running for 24 hours, when compared by our water-shed; but 288 cubic feet running for 24 hours would be 20 mill-powers instead of 10.

Q. I understand.

A. Provided it is used 12 hours per day.

- Q. Then you would still think,—that is what I want to get at, - that there was not that amount of water in Concord river?
- A. That the Concord river would not supply 288 cubic feet per second during the 24 hours, -- during a dry time.

Q. Nor anything like it?

A. I should expect it to be less than that.

Q. Now I come to the point in the case that I want to get out. If in practice it actually does supply that by measurement, it will turn out that that difference between the theoretical water-shed supply, in the dry season, and the actual supply that comes down the river for use, must be the result of the reservoir and the storing of it?

A. Ask your question once more — I did not get your point.

Q. You say the theoretical water-shed supply would be much less than 288 cubic feet per second in 24 hours. Now suppose it turns out by actual measurement that an amount equal to 288 feet does come down; the only way of accounting for the difference is by the increase of the water from the storage, and using it through the various dams — would that be so?

A. Well, there would be several conditions affecting it — whether the amount of rain-fall on that district were greater than is usual in this neighborhood; and it would depend on some other considerations; I cannot say that the one you speak of is the only thing it would depend upon.

Q. You have testified that the Concord water-shed is an average

good one.

A. No, sir — the upper Sudbury.

Q. That the upper Sudbury is an average good one — don't you

think that the lower one is an average good one?

A. No, sir, I do not; i. e., I think that there is probably a waste from the meadows, that makes it not so good as an average.

Q. If it does not give you a good average, why were you not

fair enough to tell us before?

A. I endeavored to answer your questions.

Q. If you came here in order to endeavor to show us how much water we take away from you, — that the average water-shed of the upper Sudbury is equal to the average water-shed of the Merrimack, very well. But you had in your mind and knew the fact that there was a wastage in the meadows below, so that you did not at Lawrence get the full benefit of that average water-shed, as you would if there had been only an average wasting.

A. I don't agree to that.

Q. Then we will leave that out of the calculation, — if you don't put it in. I don't care whether you put it in or not. When you talk about the upper water-shed, you say it is equal to the average. When I talk about what comes down to you, you say it is wasted in the meadows.

A. I have not said that.

Q. I understood you to say so.A. I believe I have not said it.

Q. I asked you for the water-shed of the lower Concord, and you said it was on an average with the rest of the water-sheds. Now you say no, there is a wastage on the meadows. Is there not a great wastage by evaporation — a very great wastage?

A. Yes, sir, no doubt there is.

Q. Do you believe there is as much water comes down from the upper Sudbury river to the Wamesit dam as there would be in

ordinary streams, taking into consideration the meadows?

A. I don't believe that the same water that starts from the upper Sudbury — that so large a proportion of the same particles of water that start from the upper Sudbury — gets to Wamesit dam as if there were not a larger than usual evaporating surface between the two.

Q. Now do you believe that so large an amount of water from the upper water-shed goes to Wamesit dam as there would from other rivers, such as the Merrimack and its feeders?

A. No, sir.

Q. Then there is a loss of water. Now I return to my question: Why didn't you tell us about that?

Mr. Storrow. The question has not been asked. I propose to ask it of other witnesses, and have so stated.

Q. Why didn't you tell us about that?

A. It was not asked.

Q. You knew about that all the time? A. Certainly; but I was not asked.

Q. You knew that would diminish the value of the upper watershed?

A. No, sir.

Q. You knew it would diminish its value as a water-shed, and afford a bar to Wamesit dam?

A. No, sir, I don't know that it would diminish it.

- Q. An ordinary water-shed would bring down more water to the Wamesit dam?
 - A. Do you mean more than the whole Concord does?

Q. Yes, sir. A. Yes, sir.

Q. It is lost in the meadows. Now then, Mr. Mills, we will come back to the other portion. Taking the wastage at Concord - assuming that it is an ordinary.stream, and taking that outdo you think that there would be from the water-shed of the Concord 288 cubic feet per second, 24 hours in the day?

A. You mean leaving out of the account the wastage?

- Q. Yes, sir.A. There would not be permanently through the summer 288 cubic feet through the 24 hours of the day.
- Q. That is, the water-shed of the whole Concord would not afford 288 feet per second?

A. Not through the 24 hours of the day. Q. How much would it, in your judgment?

A. Between 200 and 225. I should think not much more than 200.

Q. For what proportion of the year?

- Mr. Storrow. What portion of the year it would furnish it, or would exceed it?
- A. It might be for two or three weeks of the year, during some very dry years, that it would be less than that.

Q. 200 feet for how long a time in the year?

- A. You would not ordinarily expect it for more than eleven months.
- Q. (By Mr. Merwin.) That would be the minimum, as I understand?

A. Yes, sir, that amount would be supplied for more than

eleven months in the year, — 200 cubic feet per second.

Q. (By Gen. BUTLER.) And you say that it could not be depended upon for a permanent supply during the whole year for more than 200 cubic feet?

A. No, sir, not during the 24 hours, I should say,—200 cubic

feet per second.

- Q. And therefore, if running in a state of nature, you think it would be about 200 cubic feet?
- A. That that would be the minimum; that that would be the permanent supply for the 24 hours.

Commissioner Russell. If it were an ordinary stream?

Gen. Butler. Yes, sir.

Q. Now, do you think the wastage of the meadows would be greater or less if the stream were in its natural state, and no flowage back?

A. I don't quite understand your question.

Q. I will try to make it so that you can; you say that there is

wastage through the meadows by the flow and the percolation of the rainfall. That stream you know now has a dam, either natural or artificial. Do you think that the wastage would be greater in the present condition of the river (with the reservoir and dam), or less, than in case you had the natural flow of the stream coming down, in a state of nature?

A. You speak of "natural or artificial dams." I don't know just

what you mean.

Q. Now to put the question exactly, so that you will have no difficulty about it: There are artificial dams on the stream, and you have seen them, I take it?

A. Yes, sir.

Q. I assume that those dams flow the stream back more or less. They do somewhat, don't they?

A. They do in their immediate neighborhood, certainly.

Q. Do you think the wastage would be greater or less in the river as it is now, with those dams and reservoir, that it would be if the river was in a state of nature, without any dams?

A. The wastage from evaporation would be greater with dams

and reservoir than without.

Q. Is there any other wastage than mere evaporation?

A. If there were not dams, there would be wastage after each storm, probably. It could not be used, probably, to the same extent that it could with the dams.

Q. Any other wastage? Any wastage from the soakage into the ground when it is dry, so as to take it up, in the summer?

- A. Well, whether the difference would be greater with the dams there, or without, is a local question that I cannot answer. It would depend upon how much the meadows were flowed, how low the water would stand without the dams there.
- Q. Would there not be a very large soakage outside of where the water flows from the water-shed in the area?

A. Yes, sir.

- Q. Then there would be all the dry land that was flowed, would there not, in a state of nature?
 - A. No; I cannot say that the meadows would be dry land.

Q. Where it was not flowed, I suppose?

A. No; not necessarily dry.

Q. Not necessarily, you say. Would they take up any water?

A. Yes, sir.

Q. Now, then, upon the whole can you give me any amount of water which you say from your knowledge you know in a state of nature would come from the Sudbury river, at the city's dams, down to Lawrence, as an effective water-power, — about which you can say: "I know so much would come, in a state of nature, and from my experience as an engineer"?

A. I cannot tell how much of that water from the upper Sud-

bury would reach Lawrence.

 \dot{Q} . Could you tell that any would?

A. Yes, sir.

Q. In the dry season?

A. Yes, sir.

Q. Well, what proportion? How much?

- A. Well, I have no question that there is, after the taking of this water from the upper Sudbury, sufficient water coming in to supply the evaporation, and for all wastage in the territory below, so that the cutting off of this upper Sudbury water would be a reduction of the quantity at Wamesit dam, or at Lawrence, by just the amount of the water so cut off.
- Q. I suppose that is so. But what I want to get in is, "how much?"
- A. Oh, the yield of the upper Sudbury is about forty to fiftyfive cubic feet per second in a dry time.

Q. (By Mr. Storrow.) That is for the whole 24 hours?

A. Yes, sir.

Q. (By Gen. Butler.) And by "a dry time" do you mean the ordinary dry months of the year?

A. Yes, sir. That is, that would be the smallest quantity that

would be derived from that river.

Q. Mr. Storrow, as commissioner of the State, made some experiments there, didn't he, on the Sudbury?

A. Yes, sir.

Q. Were you engaged with him?

A. I was.

Q. How long did you work on those rivers?

A. Some three months, I think, on the river itself, and in office work considerably longer than that.

Q. So that you are quite familiar with the Sudbury?

A. No, sir. I was stationed at Billerica dam, and was not on the meadows a great deal.

Q. You were stationed there three months?

- A. Yes, sir. Q. When was that? A. In 1861, I think.
- Q. Did you measure the amount of water running there then?

A. I think I did.

Q. How much did you make it?

A. I don't remember.

Q. Who has got the measurements?

A. I don't know.

Q. Have you got any details of them?

A. I don't think I have.

Q. Were they returned to Mr. Storrow?

A. I don't know; I don't remember.

Q. Whom were you making them for?

- A. There were no measurements ordered by the commissioners at any time. I think I made some measurements there on my own account.
- Q. Have you not got some notes by which you can tell us what those measurements were?

A. I don't know that I have.

Q. Were you there during three months?

 Λ . Yes, sir.

- Q. Did you measure during that time?
- A. I measured during that time. Q. How long did you measure?

A. I don't know.

Q. About how long?

A. I have measured the height of the water for every hour.

Q. How long were you engaged in it?

A. I think some three months.

Q. Did you make measurements for the purpose of ascertaining the supply of water?

A. I made measurements to see on what days there was about

the same quantity of water running.

Q. And therefore you had to ascertain the quantity that was running in order to do that?

A. Yes, sir.

Q. Now, can you tell me what the average quantity was that was running there?

A. No, sir.

- Q. Have you not any remembrance of what those measurements were?
- A. I have this. I remember a reference in the report to an occasion when there was about 100 cubic feet a second running.

Q. How much was running at any other time?

A. I don't know.

Q. Can you give me any other amount that you remember was running?

A. No, sir, I don't remember any other.

Q. For how long was that running?

A. I don't remember.

Q. [Referring to book.] Did you see this report, made to the Legislature?

A. Is this the report of the Commissioners?

Q. Yes, sir, it looks like it.A. Yes, sir.

Q. Did you read it at the time? A. I suppose so; I think I did.

Q. Did you see any mistakes in it?A. I don't remember any.

Q. There were none called to your attention at that time?

A. No, sir.

Q. The tables, too, — were they prepared by you?

A. No, sir. I think I worked on them some. Q. So as to know whether they were correct?

- A. I don't think they were put into my hands to test and see whether they were correct or not. The tables are, as I remember, the observations of the different observers — some 30 or 40 of them — on the river.
- Q. Now, the references in the report were in these words that you remember, were they not?

[Reads from report.]

"Of course, any material diminution of the quantity of water

running in the river would further reduce its level above the fordway, - but such change of level would be due to the lessened quantity, not to the change at the dam. The four days commented upon above followed after a long-continued period of dry weather, some of which had been exceedingly hot; and the quantity of water then running in the river (there was being discharged at the dam about 100 cubic feet per second) was probably not greater than the ordinary summer flow of the river."

That was what you referred to?

A. Yes, sir.

Q. Station 28 was at the fordway, was it not?

A. I think it was at the fordway, — just a little above.

Judge Abbot. At the fordway which you called the attention of the Commissioners to as a natural dam, just above the artificial one?

- Q. I wish you would look for those measurements for me. A. I don't think I could find them; I don't think I have them.
- Q. (By Mr. Storrow.) Have you any figures to tell generally about how much of the rainfall of the year gets into the streams?
- A. Well, it is the common understanding of engineers that about 50 per cent. of the rainfall of the year gets into the stream in this part of the world.

Q. (By Gen. Butler.) You mean in average places?

A. Yes, sir.

Q. And how much during the three summer months, say July, August, September?

A. From 25 to 30 per cent. The New York experiments made it 28.

AFTERNOON SESSION.

John Worcester. — Sworn.

Q. (By Mr. Storrow.) Mr. Worcester, state your name.

A. John Worcester.

- Q. Residence?
- A. Lawrence.
- Q. Occupation and profession?

A. Civil engineer.

- Q. Are you employed by the Essex Company, or not?
- A. I am, and have been in its employ a little over two years.
- Q. In what capacity?A. First assistant.
- Q. To whom?
- A. Mr. Mills.
- Q. Whether or not, under Mr. Mills, you have measured or ascertained by computation from the maps the areas of the watersheds which I am going to state to you, namely, the whole watershed of the Essex Company above Lawrence, including the Sudbury area, the area of the upper Sudbury water-shed,—by which I mean the water-shed of the Sudbury, above the point of diversion by the city,—and the area of the lower Sudbury,—by which I mean

the drainage area from that point of diversion down to the Assabet,—and if so, will you state the results as to size of each area which you got?

A. The total drainage area of the Merrimack river above the

Essex Co.'s dam is 4,136 square miles.

Q. How is the upper Sudbury area?

A. 72.3 square miles.

Q. The lower Sudbury area?

A. 62.5 square miles.

Q. Will you state how you got these areas?

A. The size in New Hampshire was obtained from Carrigain's map, and the county maps, the nine lower counties of New Hampshire, and averaging the two results.

Q. And the Massachusetts area?

A. The Massachusetts areas are all from Borden's and Walling's State maps.

Q. Now state the process which you pursued in getting the

areas.

A. Drawing the line that marks the different ways the water runs by taking a point half-way between the two rivers, the sources of the rivers that flow in the different directions, between the source of the rivers and streams that run into the Merrimack, and the sources of those that run into the Connecticut, or the Androscoggin, or any other river that runs away from them, and drawing a line connecting these points; take them half-way. If the map showed any mountains on it, in that place, the line was drawn over the peak of the mountain, because that would be the only natural divergence of the streams; then the line having been drawn round that way, the area was measured by dividing it up into triangles, in the usual way of measuring areas.

Q. Did you measure the area of the Concord river above Bil-

lerica or the Wamesit dam?

A. Yes, sir.

Q. Can you tell me what you got there above the Wamesit dam?

A. 352 square miles.

Q. (By Mr. Shattuck.) Does that include the Sudbury?

A. Yes, sir.

Q. (By Mr. Storrow.) Have you got it above the Billerica dam?

A. No, sir.

Mr. BUTLER. That is, not distinguished.

Mr. Storrow. Yes, not distinguished. He has not got the precise amount.

Cross-examination.

Q. (By Mr. Butler.) Can you tell me whose maps of New

Hampshire you used?

A. The State map was Philip Carrigain's, published in 1816; the county maps were made from surveys by H. F. Walling, and Chase,—they were made by Walling, Woodford and Chase.

Q. Those were private speculations, I take it, and not authorized official maps?

A. I believe not.

- Q. How much did the map of 1816 show as to the topography of the country; what mountains were shown on it?
- A. It showed the prominent peaks of the White Mountains, and a great many of the rivers; and mountains like Monadnock, Moseilauke, Profile mountains, and the Uncano. *

Q. It showed only the prominent mountains which had names

known to them?"

A. Yes. Well, there were others. It gave a little topography, without giving names of the hills.

- Q. And your rule was, unless there were mountains shown, to take the dividing line where it appeared between two rivers?
- A. Yes, sir; take the dividing line half-way between the sources of two rivers.
- Q. Assuming that they were traced on the map to some common peak, which furnished from one side or the other the water?

A. Yes, sir.

Q. How far up did you go in New Hampshire?

A. To the Twin Mountains; they are on the extreme northern line.

Q. To the Twin Mountains?

A. Yes, sir; at the extreme northern line.

Q. Did you include Fabyan's House? Did you go up as high as that?

A. I don't remember.

Q. Do you know how far the head-waters of the Merrimack are from the Connecticut?

A. No, sir; I do not.

Q. Have no memory about that? Don't you know you can shoot a rifle-shot from the pond making the head-waters of the one into the pond of the head-waters of the other?

Mr. Storrow. There is only a dividing line between the two water-sheds. They are adjoining water-sheds. You can, of course,

throw a stone across from one to the other.

Mr. Butler. I take it as the dividing line where the water

flows each way.

Q. Do you not know the fact that a great portion of that map, all the upper part of New Hampshire shown by that map, was in fact totally uninhabited and uninhabitable and unexplored?

A. No, sir; I do not.

Q. You don't know whether it was or not?

A. I know it was inhabited some up there and explored.

- Q. Yes, some parts were inhabited, but a large portion of it was wood and forests, the original forests at that, in 1816, 60 years ago. Have you got that map that you took the distances from?
 - A. I have it at the office.

Q. Here?

A. It is in Lawrence.

Q. I wish you would bring it down here to-morrow, and come

with it: I want to see it and ask you something about it, if you will?

A. Yes, sir.

Mr. Butler. Will you have it sent down, Mr. Storrow?

Mr. Storrow. Yes, sir.

Re-direct.

Q. (By Mr. Storrow.) Did you, at the same time you took the water-shed of the Merrimack, above Lowell, take the water-shed of the Locks and Canal Company?

A. I did.

Q. And what result did you find from that?

A. Excuse me. I only computed the Locks and Canal watershed in New Hampshire; I did not separate it.

Q. That would be the same as ours in New Hampshire?

A. No, sir.

Q. How much did you find for the Locks and Canals New Hampshire water-shed?

A. 3,069 square miles.

Q. That is their New Hampshire Merrimack-river water-shed? A. Yes, sir.

Q. That does not include their Massachusetts water-shed, I understood?

A. No. sir.

Re-Cross.

Q. (By Mr. Butler.) Do you make any difference in the water-shed of the two companies down to the line where you

came, or did you call them the same water-shed?

- A. There are small brooks running into the Merrimack that we get between Lowell and Lawrence, that rise in New Hampshire, so we have about ninety odd miles more in New Hampshire than the Locks and Canal Co.

Q. What brooks are they?A. I cannot state their names.

Q. Brooks that rise in New Hampshire?
A. Yes, sir.
Q. What was their water-shed in New Hampshire?

A. 95.8 square miles. Q. In New Hampshire?

A. Yes, sir.

Q. All those brooks, that is, belonging to the water-shed of the Merrimack above the Essex Co.'s dam, and which don't belong to the water-shed above the Locks and Canal Co.'s dam? Did you make any difference in your computation between the line of New Hampshire, or did you take the whole of the river?

A. I took that above the New Hampshire line, from the New Hampshire maps, and those in the Massachusetts line I took from

the Massachusetts maps.

Q. What I want to get at is, does that ninety-five miles show

the brooks alone or only the brooks that rise in New Hampshire, taking the whole area?

A. It shows the area of them in New Hampshire. Q. What is the area of them in Massachusetts?

A. I don't know.

- Q. That is, you find ninety-five miles of such brooks in New Hampshire which flow into the Merrimack, and you computed the New Hampshire water-shed of the brooks, but didn't compute the Massachusetts water-shed?
- A. I obtained their Massachusetts water-shed, but it was included in the whole of the Massachusetts water-shed above the Essex Co.'s dam.
 - Q. Yes, and you cannot tell what portion?

A. No, sir.

CHARLES S. STORROW.

[Direct examination resumed from page 68.]

- Q. (By Mr. Storrow.) Please to state what led the Essex Co. to make the observations and measurements, which have been presented by Mr. Mills in his tables, as to the yield of the Merrimack river at Lawrence?
- A. It was the object of the greatest interest to us, of course, to know the value of our water-power, what we could safely lease permanently, and what we had better retain in our own hands to use without leasing permanently, and for many years before Mr. Mills came to us, investigations were made, with the view to ascertain that. Since he came to us, they have been made with more care, with more accuracy than ever before, because we had a more accurate, intelligent and skilful observer in Mr. Mills.

Q. Whether, or not, you have had knowledge of Mr. Mills' observations and experiments and measurements as he has gone along, and whether, or not, the methods employed, and the results obtained, have been a matter of consultation and conference

between you and him?

- A. They have been constantly a matter of examination and discussion and suggestion from one of us to the other; he, being the engineer, having it chiefly in charge, and I as the general managers of the affairs of the company, desiring that very information which I set him to obtain; and moreover, as engineers, we have frequently consulted together; but yet he has nothing to learn from me.
- Q. What can you state, in your opinion as an engineer, as to the accuracy and the reliability of the tables he has presented, showing the flow of the river at Lawrence, and his deductions from them as to the amount of mill-power at Lawrence?
- A. I think they are as accurate as the nature of the case will allow. These very large quantities cannot be determined with absolute mathematical accuracy; they can be determined with accuracy sufficient for the practical purposes of erecting mills and putting in machinery with the prospect of using it advantageously. I should rely on the estimate he has made, more confidently than anything we have hitherto had as regards the practical value of

our water-shed, and the amount available for daily use at Lawrence.

Q. Assuming that the Sudbury water-shed is about 2 per cent. of the whole Essex Company's water-shed, I want to ask you whether any measurements or observations at Lawrence of the amount of water flowing there, even if absolutely accurate, would or would not show on any particular day that that drainage so diverted had been diverted from you or was present as it was the

day before?

A. The measurements by Mr. Mills, made with as great accuracy as it is practicable to make them, show what passes there on any given day, but where that comes from, what shed may deliver the most, and what hundredth part of our sheds may deliver the most or the least, it is impossible to say. We know that certain water may be started from the New Hampshire reservoirs, 100 or 200 cubic feet, and, of course, we know it comes — it is our own — on a certain day, and the next day and the following day the river may be lowering from other causes; and we may have water shut off, and the next day the river may rise. thousand causes, spread over these 4,000 or 4,100 and odd miles. affect the absolute quantity we receive, and we cannot tell which cause may add something and which cause may take off some day by day. I mean we cannot discriminate the several elements which go to make up the aggregate we receive there, and that would be the case if we did measure with mathematical accuracy.

Q. Now I will ask you whether, if as it ordinarily varies from day to day, or from week to week, the water not remaining the same, the variation will be equal to or will exceed 2 per cent. of the

total?

A. Assuredly. It is very seldom the river is constant 2 per cent. It may be so for a few days, resulting from causes acting in different directions, which may produce a constant effect. That is, the result comes from so many and such various sources and causes that it is impossible to discriminate any particular one, although we may know that it comes as an effect, to a certain extent, in one direction, as the diversion and the letting down.

Mr. Storrow here put in to be printed "C.S.S. 5," which was

put in, on page 49, on Thursday.

ESSEX COMPANY.

SURPLUS WATER-POWER. - AMOUNT USED, AND ITS VALUE.

Quarter ending.	Average of quarter actually used.	
	Mill-powers per day.	
January 1, 1871	$\dots 28.59$	Amount received by Essex
April 1, "	20.07	Company for surplus water-
July 1, "	23.19	power in 5 years, \$219,-
October 1, "	17.80	447.00.
January, 1872	18.66	Average for 1 year, \$43,-
April, "	22.67	889.40.
July, "	13.72	Average used, 19.955 mill-
October, "	13.42	powers, or say 20 mill-
January, 1873	16.67	powers.

April, July, October, January, April, July, October, January, April, July, October,	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	20 mill-powers, at \$2,194 per year = \$43,884. This was actually received. 36.57 mill-powers, at \$1,200 a year = \$43.884. Thus for the five consecutive years the Essex Company received for surplus power \$2,194 per year per mill-power instead of \$1,200, price of permanent power. \$2,194 is 6 per cent. on \$36.577. A mill-power used 7 months, at the rate of \$2,194 per year, gives \$1,280.
		\$36.577.
	$\frac{1}{20}$ = 19.955	· · · · · · · · · · · · · · · · · · ·
		Thus we have received as
		much for a temporary mill-
		power used 7 months as for a permanently-leased mill-
		power used 12 months.
		power used 12 months.

SURPLUS WATER-POWER. — AMOUNT RECEIVED BY THE ESSEX COMPANY FOR ITS USE.

January 1, 1871	11,935 88 $13,606$ 24	} L
• • • • • • • • • • • • • • • • • • •		\$53,301 52
January, 1872	9,909 10	S Í
April, "	12,358 28	3
July, "	6,985 28	3
October, "	6,301 56	3
,		35,554 28
January, 1873	8,616 72	· ·
April, "		
July, "····································		
October, "	,	
• • • • • • • • • • • • • • • • • • • •	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	35,196 80
January, 1874	8,866 40	,
April, "		
July, "····································	'	
October, "		
		44,570 44
January, 1875	12,168 04	,
April, "		
July, "		
October, "		
october,		50,823 96

\$219,447 00 = 43,889 40

Q. Now will you produce a table of the use of the sold surpluspower which is mentioned in "C.S.S. 5," discriminating between the amount that you received at \$12 per power, and the amount that you received at \$4?

A. I prepared such a paper.

Commissioner Russell. It is herewith produced, marked "C.S.S. 6," and entitled "Surplus-power at \$12 and at \$4 per day."

ESSEX COMPANY.

RECEIPTS FOR SURPLUS WATER-POWER.

·	\$4.00.	\$12.00.
January, 1871	\$4,501 00	\$13,256 92
April, "	3,423 68	8,512 20
July, "····································	4,051 68	9,554 56
October "	3,237 44	6,764 04
January, 1872	3,778 24	6,130 92
April, "	4,430 48	7,927 80
July, " "	2,928 20	4,057 08
October, "	3,129 96	3,171 60
January, 1873	3,493 68	5,123 04
April, "	2,786 60	4,848 60
July, "	2,638 64	3,933 36
October, "	4,287 40	8,085 48
January, 1874	3,220 32	5,646 08
April, "	4,116 20	5,047 08
July, "	4,052 64	6,672 48
October, "	5,611 92	10,203 72
January, 1875	3,970 44	8,197 60
April, "	4,593 88	8,410 92
July, "	3,693 76	6,626 76
October, "	5,035 68	10,294 92

\$76,981 84 \$142,465 16 76,981 84

\$219,447 00

Q. (By Mr. Storrow.) I will ask you whether recently you have made any change in the price of the \$12 power, and if so, what? and state your reasons for making that change?

A. We have —

Mr. Butler. I object. I don't think reasons extend to this part of the case.

Mr. Storrow. If the question is objected to I withdraw it. I desire it to appear that the question was asked, and not answered

because of the objection.

Q. Will you state whether, in fixing the price for surplus powers, which is named in the regulations for the use of surplus power already put in the case, you and Mr. Mills together made any computations as to the price or cost of steam-power and what relation you found between the cost of steam-power and the \$12 a

day for mill-power — which you found to be the greater of the two?

A. We did. It was one of the elements which led us to fix \$12, and no more, as the price of that water-power, as we found that was decidedly below steam. Without remembering exactly the figures, I think we found steam to be about \$15 where we charged \$12, and we desired, of course, that the companies who had these large engines should use our surplus power and pay for it, rather than start them; and they have done so.

Q. Which mill is the largest user of the surplus power?

A. It is the largest mill in Lawrence — the Pacific Mills — by far the largest in quantity.

Q. And how as regards percentage on their permanent power?

A. They have used at times more than 50 per cent. excess beyond their leased power, not unfrequently.

Q. Now, how about the little mills at Lawrence—the paper

mills and what we call the small mills?

A. They have varied. Some of the smaller mills have used a very much larger percentage—a large percentage to them as regards the small amount of permanent power. There is one mill—Mr. Russell's. He owns one mill-power, but has more commonly used two and a half than anything else, but they have frequently used double. That is a large percentage, though the absolute amounts have been small.

Q. Does the Essex Company at Lawrence let power by horse-

power on their land, and if so, where and at what price?

A. We do. We have erected on the south canal a mill, which we call the Union mill, at the very extremity of the canal, where we put in a wheel and shafting and don't manufacture ourselves, but let room with the right to draw power from the shaft—a mill of considerable size, 200 feet by 60.

Q. (By Mr. Butler.) When was this done?

A. It was done in the year when those sales of land we spoke of were made, at the same time when Greenbank's mill was put up.

Q. What year was that?

A. 1872.

Mr. Butler. I shall object to that.

Q. (By Mr. Storrow.) What do you charge and receive for the power per horse-power per year in addition to the rent which you charge and receive for the room occupied by the tenant?

Mr. Butler. I object, because this was after the act authoriz-

ing the taking of the water was passed.

Q. (By Mr. Storrow.) My question was what the Essex Company charge and receive for the power per horse-power per year, in addition to the rent which they charge and receive for the room occupied by the tenant?

A. We charge \$75 per year for horse-power, for the right to take the power from the shaft which we have put in there, ex-

clusive of the room of course.

Q. And how does the rent which you charge for the room compare with the cost of the land and building which is occupied?

A. The charge for room would give us about 6 per cent. on the cost of the structure. That is, we fixed it at about that price, in-

cluding land. No, I think it hardly would include the whole value of the land. We have got perhaps the rent a little too low. To give you the figures, the rent would be about \$3,600, and we laid out there about \$50,000.

Q. And the land would be worth about how much?

A. Well, at the rate which we sell to use the mill-powers the land would come to about 12 cents a foot.

Q. And that would be about how much for that land?
A. This mill occupies about 300 feet; about \$9,000.

Q. (By Commissioner Francis.) Does the \$50,000 include the water-wheel and shafting?

A. It includes everything.

Q. And that would include the power?

- A. Yes, sir. We didn't build it for the sake of a large interest out of the building of course, but we meant to get rent enough to pay for that.
- Q. Will you state now, assuming that the water-shed of the lower Sudbury, from the city dam down to the Assabet, is 62 square miles, whether that drainage area will supply as much water as is lost by evaporation or wastage in that part of the Sudbury river, and the meadows which it passes through in that area, taking into view the character of the Sudbury as it is through that area, with the meadows which adjoin it?

A. I have no question at all that that 62 miles supplies more water than is evaporated off that 62 miles, or from that 62 miles. If it were not so, we should have at Concord, from a water-shed of 135 miles, less water than we have in the same water-shed from 72

or 73 miles.

Q. If you have made any calculations which lead you to form that opinion, I wish you would state what they were, and the results of them?

A. The calculations or observations which lead me to form that opinion are these: I find that the Cochituate water-basin, which I believe everybody knows to be not a particularly good one, has never failed to supply more than its evaporation; that is to say, from the table contained in the city documents, there has always been a daily yield, more or less. I think the least has been four or five million gallons a day.

Q. (By Mr. Butler.) A daily what?

A. A daily yield from the water-shed of the Cochituate.

Q. (By Mr. Storrow.) Will you state how the open water evaporating surfaces of the Cochituate basins compare with the surfaces of the Sudbury river, in the lower Sudbury area and the Sudbury meadows added together?

A. I believe that the water surfaces on the Cochituate basin are larger in proportion to its size than the water surfaces in the lower Sudbury would be if the meadows were called water

surfaces.

Q. Can you state the figures? Give me, if you can, the area of the Cochituate water-shed and of the open water surfaces in it.

A. I am not sure that I can state them exactly, for I received them from others.

Q. From Mr. Worcester?
A. From Mr. Worcester.

Q. State what you received from Mr. Worcester and I will verify them by him afterwards. State what the results were.

A. It was the lower Sudbury basin I was speaking of.

Q. Have you got the lower Sudbury basin there? If so, will you state the amount of exposed surface of the stream of the Sudbury and the meadows both, in that lower basin?

Mr. Butler. Why don't you ask him down to the Billerica

dam?

Mr. Storrow. I don't mean that. I will ask that by and by.

I mean from the city dam to the mouth of the Assabet.

A. The figures which I had were these, — I didn't make them personally, — that of those 62 miles of water-shed —

Q. That is the lower Sudbury?

A. The lower Sudbury,—there were 3.12 miles of water surface, including meadows.

Q. Well, you mean by that to include, do you, the main channel

of the Sudbury and the meadows also?

- A. That was meant to include the main channel of the Sudbury and the meadows also, supposing these meadows were covered with water.
 - Q. The whole amount of meadows is stated to be 4,000 acres? A. In the commissioners' report it is stated to be 4,000 acres.

Q. From where to where?

A. From Billerica to the upper end of all the meadows.

Q. And what portion of it is above the Assabet and what below?

A. I believe in this report one-half was considered to be above the Assabet and one-half below. 3.12 would include the river sur-

face and one-half of these meadows.

Q. That is, one-half of those meadows from the city dam to Billerica, you assume to represent the whole of the meadows from the city dam to the Assabet?

A. Yes, sir.

Q. Now can you give me the amount of exposed water surfaces, pond surfaces, I mean not water-courses, in the Cochituate basin?

A. On 19.72 square miles of water-shed, which is the extended Cochituate, $1\frac{1}{4}$ square miles of water surface; that is something more in proportion than in the other.

Q. You said that the Essex Co., or its proprietors, bought all their land substantially before they began to do anything about

the dam or creating the water-power?

Mr. Butler. I only want to call your attention to the fact that this class of examination is out of order.

Mr. Storrow. This was a question which was put to the witness on cross-examination on page 66, which drew out a fact as to the affairs of this Company. Now I ask him the reason for it:—

"Q. Did the Essex Company pay anything like one cent a foot

for any of the land?

A. Their original purchase was \$300,000, which covered 1,800 to 2,000 acres; at a very high price, some of it."

I now propose to ask him why he bought the land. Mr. Butler. Well, you may put that question.

A. It was to make money out of it. Q. To make money out of what?

A. To make money out of both together, and the land gave us our return. If we had had no land, we shouldn't have built any dam; and if we couldn't have built any dam, we shouldn't have bought the land.

Cross-Examination.

Q. (By Mr. BUTLER.) What is the capacity of the Winnipiseogee lake to supply water in a dry season?

A. That is a question I cannot answer with any precision. We

draw from it -

- Q. I don't care what you draw, for you may not draw all you want to, or you may draw a great deal more than you want to. What I want to know is what its capacity to supply water in a dry season is? You went into this expenditure, and you must have some idea, I suppose, of how much water you were going to get for it.
- A. We knew the supply would be very large, and would bear the expenditure of a large amount of money; but we had two objects in view, which were somewhat prominently brought forward in the beginning; one was to secure a useful arrangement, and the other was to prevent a prejudicial arrangement with the view to blackmailing us.

Q. That is, that somebody should not keep back the water and

let it down when you didn't want them to?

A. Precisely so.

Q. And so that you could control it yourself?

A. Yes, sir.

Q. That would be more disastrous than to carry it off, wouldn't it?

A. I don't think they could hurt us by letting it down.

Q. Well, what do you mean by blackmailing?

A. I mean by buying it up, and finding it was very useful and

coming down to us and making us pay a high price.

Q. I hope you don't call that blackmailing, for isn't that precisely what the Essex Company do, — buy up a large amount of water and land and sell it out at a very high price?

A. But to nobody who cannot use it advantageously.

Q. How much water did you expect to utilize in a dry season? How many cubic feet do you think you could draw in a dry season? I mean the dry months.

A. The most we have ever drawn, I think —

Q. Pardon me —

A. We have drawn as much as we could.

Q. Well, then, tell me how much you have drawn?

A. The most we have drawn, and the most we believe we could draw and ought to draw, was 400 feet a second for 24 hours.

Q. How long could that draft be kept up?

A. I cannot say; but not for a great many days. Of course that depends upon the condition of the lake at the time we begin to draw, and there have been years when the lake didn't fill up.

Q. Assuming that the lake would fill with winter snows and spring rains, I want to get at its capacity, if I can. Suppose it fills up to the height of overflowing, how much is its capacity? There is a gentleman on the commission who knows a great deal better than I do, and I guess quite as well as you do, but it will not appear in the book, that is the trouble. I don't care whether it is 100 gallons or 100,000. I only want to know what it is.

A. Of course that is a matter which varies from year to year. Q. Well, I was supposing it was full. Suppose it fills up?

A. I should think it would make a difference to us of 20 or 30 mill-powers in the course of a year. It is a thing which varies so much that it is very difficult to give an actual calculation.

Q. What I want to know is its capacity, not what you want to draw. How much have you calculated you could draw from it? Or

have you not thought of that question?

A. I have had no figures in my mind for twenty years on the

subject.

Q. Now, sir, has not your company raised that lake lately; added to it?

A. No, sir.

Q. Haven't you added to the height?

A. I think not. I don't think the dam has been changed for twenty-five years.

Q. The dam may not be changed, but hasn't the height of your gates been changed?

A. I think not.

Q. Can you tell me how many mill-powers you have sold on an average for the last seven years, leaving out 1869; say, from October 2d, 1869, to to-day?

A. Do you mean how many we have sold, leaving out the 13

which we sold on the north side?

Q. Yes.

A. We have sold seven on the south side. Q. Sold altogether, I want to get at it?

A. I may not have got your date correctly. We began to sell, I think the first date was in 1866, of the south side mill-powers.

Q. How many have you sold during the last seven years?

A. Without consulting my books, I think we have sold four of the seven in the last seven years following the three preceding, not including those on the north side.

Q. I mean from October 2d to date, so as not to include those

13, because these were sold at one time?

A. Yes, sir. We have sold to new enterprises seven in the last seven years. (Mr. Butler. That is an average of one a year.) That was all included in the table which was presented.

Q. Is there a table here?

A. There was a table, not of sales of water-power, but of sales of land, and to that was appended the mill-powers sold.

Q. For some reason or other, good or bad, or the inherent

trouble of doing it, you cannot measure your water-power within

5 per cent., can you?

A. I think we can measure it closer than that. My friend, Mr. Mills, is too modest and too conscientious to do himself justice. I think he measures within 3 per cent.

Q. So that, if everything remained exactly the same, you could not tell by any measurement of yours, whether you had Sudbury

river, or had not?

- A. We could not tell with absolute certainty. A measurement may be above or below the exact amount.
 - Q. Well, then, either way, you could not tell with certainty?
- A. I don't think we could swear with absolute certainty within 3 per cent.
- Q. Let me see. Sudbury river is less than 2 per cent., upon any idea?

A. It is.

Q. Then, if the City of Boston, after taking the water of Sudbury river for 5 years, should conclude not to take it any longer, and turn it all in, and then at the end of 5, 3, or 2 years, begin again and take it, practically, by any measurement, or in any way, you could not find out, except by learning the fact from information,

whether you had the water or not?

- A. It would be precisely like what comes to us from all other sources. There would be 2 per cent, a large quantity; but any 2 per cent., or 3, could be withdrawn without our knowing it, or knowing from where it was diverted. Sudbury river might be diverted, and we not know it. I would go farther. When we go up to the lake and start a certain quantity of water down, we know it comes, because we started it, but we cannot tell that by measurement.
- Q. Then, in view of the fact that there is no practical knowledge or measurement on that subject, would you take the question of Sudbury-river loss or gain into the question of how much or how little water-power you would sell?

A. Most assuredly.

Q. How so?

A. Because we would take our whole water-shed and its yield. Property may be taken from us without our finding immediately what has been taken, if there is a good deal of it.

Q. I understand "if there is a good deal;" but I want to know

whether you would practically take it into the calculation?

A. I certainly should.

Q. Whether you could tell it was there or not?

A. An addition to our water-shed which we would consider equivalent to 2 per cent. obtained in New Hampshire or elsewhere, and added, we should consider a valuable addition, and, if taken away, we should consider it a reduction.

Q. Now, Mr. Storrow, did you make a report on the Concord

river?

A. I was one of the commissioners. I did not write the report.

Q. Who did?

A. Mr. Alvord, of Greenfield, now dead.

Q. But you signed the report?

A. I did.

Q. Was he an engineer?

A. No, sir.

Q. Then the engineering part was entrusted to your care?

A. In part. Mr. Shedd made more observations than anybody, and had charge of the surveying parties.

Q. And your object was to get the Concord river as nearly in a

state of nature as you could, I suppose?

A. Our object was simply this—to see whether taking down the water at Billerica substantially lowered the water of the river above. This was the object to which I, as an engineer, gave my attention, leaving all others to take care of themselves.

Q. Mr. Mills was acting there under your direction, was he

not?

A. Mr. Mills was placed there as one of the observers. I think there were 25 or 30 at various points.

Q. Was Mr. Mills acting under your direction?

A. Acting under the general direction of the commissioners, not mine particularly.

Q. What was done with the observations and tables?

A. I presume they all went to the State House.

Q. Do you know what became of the measurements of Mr. Mills?

A. I don't know. The calculations were mainly made in Mr. Shedd's office, and the young men were mainly employed by him. Personally, I neither employed nor paid a person.

Q. Would not a measurement made at Billerica at that time, under that condition, show very nearly the natural run of the stream, except as it might be affected by any reservoirs above the

Sudbury?

A. I don't think it would. A measurement made there might show what was actually passing at the moment; but to measure a river you want a long series of observations, and you want them made with a view to measure. It was no part of our object to ascertain what the Concord river furnished in water, and I never directed, or knew of any measurements made to that end, although I see some were made slightly; one or two, I believe.

Q. You agreed to this report, did you not?

A. Certainly. I signed the report, certain portions having

been more particularly allotted to me to look after.

- Q. This report says [i. e., Report of Experiments and Observations on the Concord and Sudbury rivers, in the year 1861]: "The quantity of water then running in the river (there was being discharged at the dam about one hundred cubic feet per second) was probably not greater than the ordinary summer flow of the river."
- A. That was no observation made by me. I should not have refused to sign the report with that in, whether exactly correct or not. There was one particular object to which, as an engineer, my attention was directed; that was, the height of the surface of the river.

- Q. But to know that, it was necessary to know the amount of water flowing, was it not?
 - A. No, sir.
- Q. On pages 19 and 20 of the report, the commissioners say, "On the 12th of August, immediately after the observation taken at 5 o'clock, A. M., greater openings were made in the dam, and the water there was further drawn down. In two hours, or at 7 o'clock, A. M., it had reached the level of thirty-three inches below the top of the dam. It was continued at that level as nearly as possible until September 5th. But in the evening of August 12th, at about nine o'clock, a very heavy rain commenced, continuing through that night, the whole of the next day, and a part of the succeeding night. The rain-gauge recorded a fall during this time of three inches of water. On the 13th, the river began to rise, and continued rising for several days. course, rendered it impossible to ascertain the effect of this second drawing down of the water at the dam by a comparison of the succeeding days, until the effect had passed off, the rise due to the excessive quantity had subsided, and the river was again discharging about the same quantity as on the 11th.

"But between the time when this second drawing down at the dam began, and the time when the rain commenced, was a period of sixteen hours. The period was, of course, wholly unaffected by the rain; nor can we discover during this interval any cause of disturbance on the lower reaches of the river, except the drawing down, nor anything to prevent the drawing down from producing the whole effect to be expected from it on these reaches within that period of time. At the time of the first drawing down on the 7th of August, a marked effect was seen at Station 28 in half an hour; in three hours one-third of the whole effect had been produced, and in twelve hours one-half of the whole effect had been

produced."

Does not this report, therefore, show that it was necessary to

take into consideration the height of water in the river?

A. In one sense it does, but not the absolute quantity. Our observations went to show what was the effect of an artificial change; and in order to show the effect of that artificial change, we wished to take the river in a particular condition and make the change, and have no disturbing element come in; and a large rainfall (independently of what we were doing) raising the river, no matter what quantity was carried, of course disturbed our experiment, and we could not trust to those observations for the purposes of our investigation.

Q. Well, sir, your engineer, for some reason, took the absolute quantity flowing, he tells us. It would be convenient to know

that, wouldn't it?

A. It was a matter of interest. It was never asked, never ordered; but Mr. Mills, being an engineer of an inquiring turn of mind, would be very likely to make a good many investigations. It was my first acquaintance with him.

Q. Now, assuming that one hundred cubic feet per second is not greater than the average flow during this summer (implying

that it was not less), from the water-shed above Billerica on the whole of Concord river, and assuming the Sudbury river to be one-fifth of that water-shed, that would give about twenty cubic

feet a second, would it not, down at Lawrence?

A. One-fifth of one hundred is twenty; that is true; but watersheds are very different. Here is a water-shed coming down to Billerica, consisting of parts very different in their character. A portion of that water-shed may be much more productive than another portion of that water-shed.

Q. There is only four miles in extent between Billerica and

Wamesit dam.

A. Take the Wamesit dam.

Q. That water-shed has not changed within a few years; it is about the same, is it not?

A. I am not aware of any change.

Q. Then what operated upon it in 1861 would be likely to operate upon it in 1876?

A. I should presume so.

Q. Then, if the average flow from that water-shed was one-hundred cubic feet per second in the dry season, in the summer months, as found by measurement at that time, and the Sudbury river is one-fifth of that, where do you suppose the water comes from, other than that which comes from the Lawrence dam?

A. If the average flow is one hundred cubic feet per second, and if the Sudbury furnishes one-fifth, of course it furnishes

twenty feet.

Q. And twenty feet would be two-thirds of a mill-power?

A. That depends upon the fall. Q. At your place, I mean.

A. No, sir; it might be a good deal more.

Q. It might be, but you sell thirty feet for a mill-power?

A. Thirty feet, with twenty-five feet fall. In summer, when

there is thirty feet fall, it is less than thirty.

Q. We won't go into the height of the fall. When the Pacific Mills have to run their engine because the water is so high, it takes a good deal more, so leave out those matters. That would be, as you sell it, about two-thirds of a mill-power. Now, do you think that that would be at all appreciable at Lawrence, in any way, whether it was there or not?

A. It is more than two-thirds of a mill-power; but leaving that out of consideration, I don't think we could tell at Lawrence whether twenty cubic feet per second, more or less, was coming

by our observations.

Q. Or in any way?

- A. No, I don't think we could. We could be sure that it did come.
- Q. You would not alter your price of land, and sell it for less on account of knowing that there was twenty cubic feet less of water coming; or ask more for it if you knew that twenty cubic feet more of water was coming?

A. That is coming down to a pretty fine point. I don't know

where we should pull the last hair out of the horse's tail.

CHARLES J. FROST. - Sworn.

- Q. (By Mr. Storrow). State your name, age, residence, and occupation.
 - A. Charles J. Frost; Framingham; engineer, at present; 56.

Q. How long have you lived in Framingham?

- A. Since I went there last, twenty years. I was born there.
- Q. State whether, or not, you have made recently, at my request, an examination of Sudbury river from the city dam down to the mouth of the Assabet, with a view of ascertaining whether there is any current in the river, and any water in the river channel; and if so, state what you did, and the result of your observations?
- A. I didn't start from the city dam. I started from below Saxonville, and followed the Sudbury to the mouth of the Assabet.
- Q. Will you state by reference to the map now exhibited, which is the map in the report of the Sudbury-meadow commissioners, where you went on the river, and what you did when you went down?
- A. I started at Stone's bridge in Framingham, a little way above the Beaver-hole meadow. I took a boat at that point.

Q. Any one with you, or did you go alone?

A. I had a man to row me. I started from there and went to Concord. I started at Stone's bridge at 7 o'clock in the morning, day before vesterday. About half a mile below, at Weir's hole, there was a very perceptible current. That, by the way, was my object, to find if there was a current, and how much. At Beaver hole [Station 1, on the Concord and Sudbury Commissioners' plan] I measured the current, and it was twenty feet in seven and a-half minutes. The bank at this point was three feet above the surface of the water. At half-past 8, I was at the first bridge [Farm bridge], in Wayland [Station 2]. The current there was twenty feet in two minutes. The width of the stream to this point, from where I started, would vary from three to four and a-half rods; perhaps at the widest place, five. At Bridle bridge, quarter before 9 o'clock in the morning [Station 3], the current was twenty feet in five minutes. At a quarter after 9 o'clock, at the lower bridge [Canal Bridge] Wayland, the current was twenty feet in one minute. At quarter after 10 o'clock in the morning, I was at Sherman's bridge [between Station 7 and 8], current twenty feet in three minutes; at half-past 11, at Lee's bridge [just below Station 12], that is very near the entrance of Fairhaven pond. Here the wind carried the float up stream. little below this there was no perceptible current, and I will say, that during the whole time of making the calculations the wind was against me. If it had any effect at all, it would be to carry the float up stream.

Q. About how wide was the stream there?

A. I should judge thirty rods; one hundred and twenty-five or one hundred and thirty feet.

Q. How deep?

A. Without measuring, the water was very deep; I should say from ten to fifteen feet. Twenty minutes after 12, I was at Heath's bridge [Nine-Acre Corner bridge]; distance, twenty feet; time, ten minutes.

Mr. Storrow. It will not stop to ask the witness about depths. They are well shown on the very accurate profile in the Sudbury-meadows report, and the commissioners will see that the stream is very wide and very deep at those points where a very slack current was found.

Q. What was the width of the stream there?

A. The stream here was one hundred and twenty-five or one hundred and thirty feet wide, I should judge. At twenty minutes after 1, I was at Turnpike bridge [between Stations 15 and 16], very near the entrance to the Assabet. The current there was twenty feet in six minutes. That was the end of my journey.

Cross-examination.

Q. (By Mr. BUTLER.) What did you use for a float?

A. I took a hard-wood stick, about fourteen inches long, and loaded one end.

Q. How thick?

A. It was about an inch in diameter. I loaded one end, so that the top would just come above the water, so that I could see where it was.

Q. When you got down to those places, the wind had its effect, not upon the float, but upon the current, so as to set the current

the other way?

- A. At one point. It was around a curve. There was a high bluff just above, and the wind set in very strongly. It was so near Fairhaven bay, that if it hadn't been that Fairhaven bay was around the corner, I should have thought I was in Fairhaven bay.
 - Q. At whose request did you make these investigations?

A. At Mr. Storrow's.

Q. Where did you start from that morning before you went on the river?

A. I started from home.

Q. Do you know whether Simpson's Mills were running?

- A. I think they were not running, although they might be running. I will tell you an observation, if that will be to any point, that a man made on the stream,—a man who knew all about it. He said, if the mills were running, it would make a difference. He seemed to understand that there was no water coming down.
 - Q. Who made this observation?A. The man who was rowing me.

Q. He didn't say anything as to whether he knew that the mills were running or not?

A. No, sir; the water could not have got there at that time in

the morning.

- Q. Unless they had been running at night or were discharging water?
 - Λ . No, sir.

Q. Do you live near Sudbury?

A. Dam 1 is on my land.

Q. So that you have known the Sudbury for a great many years?

A. Yes, sir.

Q. Have you ever been up at the head of it?

- A. I have been up to the Cedar swamp; that, as I suppose, is the source of it.
- Q. How many miles up is that from the city dam, by the course of the river, in your best judgment?

A. It is near the centre of Westboro'; I should judge from

twelve to fourteen miles.

Q. What is the first mill on that stream?

A. Cutler's.

Q. What mill is that?

- A. It is a grist-mill and emery-mill. Q. I am starting from the swamp?
- A. I don't know; there was a small mill there, but whose it was, and what it was, I don't know.

Q. There is a small mill at the swamp, where it commences?

A. A little below.
Q. What is the next mill?

A. Cordaville.

Q. Are you acquainted with that mill?

A. Not very much.

Q. How large a business is carried on there?

A. That I can't state.

Q. Quite a large establishment, is it not?

A. I should judge not very large. Q. How would it compare with Simpson's?

- A. It wouldn't compare at all; the comparison would be too small to make.
 - Q. How large a flowage pond have they got there? A. The last time I saw it, it was a very small pond. Q. Well, how large do they have generally?

A. Oh, it might cover eight acres.

Q. Where the next, sir?

A. The next is, I think, at Ashland,—the Dwight Mills.

Q. Isn't there one above the Dwight Mills?

A. I think not.

Q. How far is Cordaville from the Dwight Mills?

- A. I couldn't answer correctly, sir; but I should judge it might be four miles.
 - Q. Is there not a mill right in sight that was pointed out to us?

A. There is a little grist-mill, perhaps half a mile above.

Q. Then we come to the Ashland pond; then we come to the Emery Works; then we come to Cutler's, and then we strike the dam of the city?

A. Yes, sir.

- Q. Isn't there a stream enters into that that has a reservoir on it?
 - A. You mean, that they are going to build a reservoir on?

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Q. No; isn't there a stream that they have built a reservoir on, years ago?

A. Oh, yes, sir. Q. What is that?

A. Stony brook comes into Sudbury river, just above the dam which is to be built, and there are two or three mill reservoirs on that brook.

Q. Now, going up that brook, what is the first mill on Stony brook, starting from Sudbury river?

A. The first mill is a little machine-shop; there is nothing done there. There are the ruins of a dam there.

Q. How long has that been in ruins?

A. There has been nothing done there these ten years; nothing to speak of; there might be a little.

Q. What is the next above that?

A. The next above that is a grist-mill. Q. How large a pond do they flow?

A. They have a small pond of four or five acres.

Q. What is the next above that?

A. The next above that is Rice's grist-mill.

Q. How large a pond do they have?

A. I am giving all these estimates from guess-work. I should judge he might have a pond there of ten acres.

Q. What next above that?
A. I don't know anything about the mills above that.
Q. There are some?

A. There are some.

Q. Isn't there a reservoir still further up?

- A. I think there is; there is another mill up there—two or three of them.
- Q. Isn't there a reservoir up there that was built by the city a number of years ago?

A. I don't know.

Q. Now, about this swamp up on the Sudbury that you talk about - wasn't that where the city built a reservoir once?

A. No, sir; I shouldn't say there was ever a reservoir there enything more than a natural reservoir.

Q. Let us see; do you know where the Hopkinton reservoir is?

A. The Hopkinton reservoir is above that, — that is some four miles from this swamp, — that empties into this swamp; simply feeds this swamp.

Q. Were you ever up to the Hopkinton reservoir?

A. No, sir, I never was.

Q. You know there is a reservoir there?

A. I know there is a pond there; that is, I believe there is.

Q. How large it is you don't know?

A. No, sir, not very large.

Q. What makes you think it is not very large?

A. I have seen a plan of it, and comparing it with ponds drawn upon the same scale that I have seen, I should judge that it wasn't a very large pond.

Q. Do you know how many feet it falls?

A. No, sir. Q. Forty?

A. I don't know anything about it.

Q. Did not the plan tell you?

A. No, sir. I might have seen it on some geographical map; no scientific map.

Re-direct.

Q. (By Mr. Storrow.) Whether the city of Boston were diverting all the water at their dam on Monday and Tuesday of this week, except a million and a half gallons a day?

A. They were.

Mr. Storrow (to Mr. Butler). Do you admit that the city actually diverted the water from their dam at the time stated by Mr. Davis in his report of last year, page 16?

Mr. Butler. I don't think I will make any admissions.

Q. Can you tell me whether the city of Boston diverted the water of the Sudbury river and stopped it from their dam, and from flowing down, at any time during the year 1875?

A. They did.
Q. When?
A. During part of the months of July and August.

Q. Did you have any occasion to notice it at that time, and did you notice it particularly?

A. Yes, sir.

Q. Have they done it since then?

A. Yes, sir.

- Q. How long have they been doing it lately, do you remem-
- A. I don't know just how long. We have been dammed and redammed so much this summer, that I hardly remember the thing; but I should think it was shut off the last two months most of the time.
- Q. How early in 1875 do you know of any diversion by the city?
- A. I don't know how early; I don't know any earlier than July. That is all I know about it. I had no occasion to take notes of it.

Re-cross.

Q. (By Mr. Butler.) This water was running down in the old conduit or old ditch that was built by the Water Board in 1872, was it not?

A. Built or dug out.

Q. They planked it some portion of the way, did they not?

A. Not that I know of.

Q. (By Commissioner Francis.) That planking that you speak of was from Farm pond?

A. I don't know that there was any planking. The channel is from Farm pond, on Sudbury river.

[Adjourned to Friday, Sept. 15, at $9\frac{1}{2}$ o'clock.]

FRIDAY, Sept. 15, 1876.

Mr. Storrow. Before we go on, I want to have it appear on the record, if the commissioners please, that last week you, in company with counsel for all the parties and the City Engineer, had a view of the premises of all the petitioners — Saxonville, Ashland, City Dam, the place of taking, Billerica, Wamesit Power Company and the mills on that privilege, the Massic Falls, the Middlesex Company's Dam, where the lower Belvidere Mill is, and the Essex Company's works at Lawrence.

JOHN WORCESTER, recalled.

Q. (By Mr. Storrow.) Mr. Worcester, can you give us the area of the Cochituate water-shed?

A. These figures are taken from City Document No. 85, of the year 1874, Appendix A, p. 46. The water-shed of Lake Cochituate, including Dug pond, is 12,077 acres.

Q. Give it in miles, please; I don't care about the acres.

A. I have the whole in miles — Dudley pond is added — 19.72 square miles.

Q. Have you got Dug pond and Dudley pond separate?

A. I have Dudley pond separate. Q. How much is Dudley pond alone?

A. 544 acres.

Q. You have not Dug pond?

A. No, sir.

Q. Now, I want the amount of open water surface in ponds.A. The amount of open water surface in a dry year is given in

the same place as 800 acres, which is 1.25 square miles.

Q. Now, the lower Sudbury drainage area between the city

dam and the mouth of the Assabet?

A. The lower Sudbury drainage area, estimated from Borden's

A. The lower Sudbury drainage area, estimated from Borden's State map, is 62.5 square miles.

Q. Now, the surface of the Sudbury river within that area and

the surface of meadows adjoining also make how much?

A. The surface of the river is 0.43 of a square mile. As the Sudbury meadows' report gives 4,000 acres of wet meadows between Billerica and Saxonville, and the plan shows that about half of that was included in this area between the Assabet and Saxonville, I took them as 2,000 acres, or 3.12 square miles, making a total of 3.55 square miles of wet surface.

Q. Now, have you got the other pond surfaces in that area, apart from the river and meadows — say, Heard's pond and some of those larger ponds?

A. Heard's pond, 0.13 of a square mile.

Q. Have you any other pond surface?

A. Some small ponds around there, and a small piece of the Sudbury above the Saxonville dam, amount to 0.51 of a square mile.

Cross-examination.

Q. (By Mr. Butler.) This State map of New Hampshire, which you have brought here this morning at my request, is the map that you took the water-shed from, is it not?

A. It is one of the maps I used in estimating the water-shed. Q. It is the map you spoke of yesterday as the State map?

A. Yes, sir.

Q. Did you have any other State map? A. No, sir, not of New Hampshire.

Mr. Butler. All that appears on this map by way of authentication is this:—"To His Excellency, John Taylor Gilman, Esquire, and to the honorable, the Legislature of the State of New Hampshire. This map, commenced under their auspices and matured by their patronage, is most respectfully inscribed by their obliged servant, Philip Carrigain."

WITNESS: There is something else [indicating].

Mr. BUTLER [reading]. "New Hampshire, by recent survey, made under supreme authority, and published according to law by Philip Carrigain, counsellor-at-law, and late Secretary of State." The date is "Concord, A.D. 1816."

Q. Now show me where you began your water-shed on the Mer-

rimack river on this map.

A. This line here in pencil shows the line that I have taken as the line dividing the drainage area on this map.

Q. Here, for instance, you carry it half way between Smith's

pond and Pine pond?

A. There is a brook to Pine pond, which, I think, you will find is about half way.

Q. Then you assume there is no brook in Smith's pond?

A. There is none given on the plan.

Q. Then you came down here between those lakes,—between Merry Meeting pond and the pond in New Durham without a name; then down to the Suncook pond; then you came to Pleasant pond, in Northwood, and Saddle-Back mountain; then you assume all the drainage in the upper part of Deerfield to flow into Lamprey river.

A. I took it about half way between Lamprey river and Sun-

cook.

Q. Now, the county maps. What was the difference in the area that you made by the county maps from this map?

Commissioner Francis. Has he stated what he made it by this

map?

Mr. Butler. Yes, sir.

WITNESS. No, sir; only the average. Q. How did you get it by this map?

A. By Carrigain's map, 2,943 square miles.

Q. How by the other maps?

A. By the county maps, 3,386 square miles.

Q. How late were the county maps made?

- A. I think they were made between 1850 and 1860. There may be some with the date 1861 on them.
 - Q. Do those claim to be from actual surveys?

A. Yes, sir.

Q. Then, in giving us the amount of area, you took the mean between the two, assuming that this map of 1816 was as likely to be correct as the county maps?

A. Yes, sir.

Q. A portion of this land covered by your water-shed turns out to be ungranted territory?

A. Yes, sir.

Q. And in the Moosehillock branch of the Merrimac river, I observe, you do not go out to the divide between the two rivers?

A. No, sir.

Q. Why not?A. Well, it is very nearly.

Q. It runs across one of them, and there they divide, don't they?

A. And then it runs across the point of the other.

Q. What point?

A. That river, the Amonoosuc, runs right down on the line, just about as much as the other. I think it is a fair division.

Mr. Butler. I want the commissioners to examine this map. They will see that it is utterly impossible to get at the water-shed with any accuracy. We all know that these early maps were not made to determine such questions, but merely to get at the surveys of land.

C. S. Storrow, recalled.

The witness produced the following table, called for by Mr. Butler [marked "C.S.S. 6"]:—

Mill-powers granted by Essex Company.

			Mill- powers.	Per Mill-power.	Rent.
Atlantic Cotton Mills Bay State Mills George Naylor Lawrence Machine Shop A. & A. Norton Lawrence Duck Co. Pacific Mills Pemberton Mills Bay State Mills William Russell Atlantic Cotton Mills Lawrence Paper Co.	1852	June 10 Jan. 15 April 5 May 1 Sept. 1 Oct. 21	8 0 1-6 2 1 2 10 5 3	\$9,336 cash 9,336 Included in sale of mill and other property In special bargain Included in sale of mill \$9,336 cash Included in contracts for mill \$5.752 cash (special bargain) \$9,336 cash Included with building and machinery	\$300 gold 300 " 300 gold 450 300 gold 300 gold 300 " 300 " 300 "
S. S. Crocker Pemberton Mill Furness & Giles Benjamin E. Hoyt	1855	Nov. 1 Jan. 1 June 11 Oct. 10		Included in previous contract	900 300 gold 900 900

Mill-powers granted by Essex Company. — Continued.

Battles & Crombie . "				Mill- powers.	Per Mill-power.	Rent.
Greenough & Sargent 1858 Oct. 5 0 2-6 Washington Mills 1859 Mar. 26						
Washington Mills	~ 1 0 0	1050	0-4	000		
Everett Mills						
Pacific Mills						ooo goru
Pacific Mills	Everett mins	1000	TILLEGE . M.			300 "
Pacific Mills	0 10 35111	"	Mor. 1		\$5,000 cash	300 "
Atlantic Cotton Mills	Pacific Mills		May 1	1 (1	9,336	300
Lawrence Duck Co.						900
Seed				1 ^		300
Stedman & Fuller 1863 Jan. 12 0 2-6 Sp. 336 Sp. 336 Sp. 300 gold Sp. 336 Sp. 336 Sp. 330 gold Sp. 336 Sp. 330 gold Sp. 336 Sp. 330 gold Sp. 336 Sp. 336 Sp. 330 gold Sp. 336 Sp. 3						000
Stedman & Fuller 1863 Jan. 12 0 2-6 8 2-6 900						
Battles & Crombie						
Perry & Wendel						
Pemberton Co			April 22	2 1	\$9,336 cash	300 gold
Pacific Mills						
Pacific Mills						300 gold
Pacific Mills	Pacific Mills	"	Mar. 1	6		300 **
Pacific Mills						
William C. Chapin (1900) Russell Paper Co. (1900) By S. R. & D. P. Crocker (1900) Davis & Taylor (1900) Davis	Pasific Wills	66	Tune 6	3 9		300 66
Russell Paper Co					wheel-pits, etc.	000
Davis & Taylor Company Company		66				
Davis & Taylor 1866 Oct. 12 1 South Canal 1,200 a yer			- 66			
James S. Munroe " 2 " 1,200 " Davis & Taylor 1868 Nov. 9 0 1-2 " 1,200 " Pacific Mills 1869 Oct. 1 3 \$9,336 cash 300 gold Atlantic Cotton Mills " 1 " 300 " Washington Mills " 1 " 300 " Washington Mills " 1 " 300 " Lawrence Duck Co. " 2 " 300 " Lawrence WollenMills " 0 1-2 300 " George E. Davis " " 0 1-2 300 " S. M. Stedman " 0 2-12 1,200 avg 1,200 avg Lawrence Flyer & Spindle Wks " " 0 2-12 1,200 avg 1,200 avg W. O. Chapin et al. " " 0 2-12 1,200 " 1,200 " Russell Paper Co. " " 0 3-12 1,200 " 1,200 " W. A. Russell et al.		66	Sept. 1			900
Davis & Taylor 1868 Nov. 9 0 1-2 1,200 1			Oct. 1		South Canal	1,200 a yea
Pacific Mills		1	"			
Atlantic Cotton Mills						1,200
Washington Mills """ 1 """ 300 "" Pemberton Co """ 1 1.2 """ 300 "" Lawrence Duck Co """ 2 """ 300 "" Lawrence WoollenMills """ 0 1.2 """ 300 "" Secorge E Davis """ 0 1.2 """ 1,200 ave S. M. Stedman """ 0 2-12 """ 1,200 "" Lawrence Flyer & Spindle Works """ 0 2-12 """ 1,200 "" W. C. Chapin et al. """ """ 0 2-12 """ 1,200 "" S. W. Wilder """ """ 0 3-12 """ 1,200 "" Russell Paper Co. """ """ 0 3-12 """ 1,200 "" W. A. Russell et al. """ """ 0 3-12 """ 1,200 "" Wulliam Russell & Sons """ """ 0 9-12 """ 1,200 ""						
Pemberton Co		1	- 66		"	
Lawrence Duck Co.		66	66		46	000
Carried Works Carried Work		66	66		"	
Colore B. Davis Colore B. M. Stedman Co	Lawrence WoollenMills	1		0 1-2	44	. 300 "
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W. C. Chapin et al.		1 ,,		0.410		7 000 4
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W. A. Russell et al		66	66			1,200
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	Total			122	Maria de la companya della companya	

- Q. Does this contain all the water sold by the Essex Company, except what you call surplus water?
 - A. It does.
- Q. It does not include the water sold to the city of Lawrence, does it?
- \mathcal{A} . We have sold them none. They condemned some, and we have received damages.
 - Q. They condemned how much?
- A. I cannot tell you; they have condemned what they wanted to use; what they wanted to pump into their reservoir.
 - Q. How many million gallons a year did they condemn?
 - A. They condemned what they might choose to pump.
 - Q. Ad libitum?

A. Ad libitum. Of course we settled with them upon such estimates as we had of their power to pump and to use water.

Q. Then the city of Lawrence has a right to pump as much water

as they choose?

A. They have for certain purposes only, and to pump from a certain place.

Q. All that they pump from a certain place, for certain purposes, they have a right to pump, — what is used by the city, I suppose?

A. For domestic and steam-power purposes; not for waterpower.

- Q. To make steam?A. To make steam.
- Q. But not to be used as water-power?

A. No, sir.

Q. For all purposes for which the city uses water, except making water-power, they have a right to use as much as they please?

A. Yes, sir.

- Q. How much did you receive for that? A. We received from them \$15,000.
- Q. By the verdict of any tribunal, or by agreement?

A. By agreement.

- Q. How many million gallons a day did you deem the utmost limit to be?
- A. We deemed that the utmost limit in the year, 1,900, would be about five million gallons a day.

Re-direct.

Q. (By Mr. Merwin.) That would be equivalent to threefifths of a mill-power?

A. About half a mill-power.

Q. (By Mr. Storrow.) Do you know how much water they are using now, and have been using up to this time?

A. About two million gallons, I think.

The witness also produced, on call of Mr. Butler, a table of sales of land by the Essex Company [marked "C.S.S. 7"]:-

Sales of Land by the Essex Company.

On the north side of Merrimack river the streets were nearly all laid out in the beginning; prices were affixed and sales made as the land was called for, but prices not reduced.

They were from time to time raised on the principal streets.

On Essex street - best business street. On Haverhill street - best dwelling-houses. 1846 Sold in 1846 at 33 cents. 15 cents. 75 " 17 " 1855 1850 36 " 1865 75 66 1860 1.25 1870

1872 1.50

1873 1.25 — very large lot. 1874 2.00

1876 2.50

These lands were included in the original purchase of large farms running to the river, of which the cost, after adding various charges for perfecting titles, etc., did not exceed \$100 an acre.

On the south side of Merrimack river a few streets only were laid out at first, prices affixed, never reduced, in many places but little raised. But as soon as sales were freely made, new streets were laid out, farther from the business centre and less valuable from their location, upon which prices were affixed and lands sold even higher, in many cases, than in the previously graded streets, where land was evidently worth more.

Thus the advance in value was obtained not generally by raising the price of what was offered for sale, but by pushing new streets and high prices farther and farther from the business centre, and so adding greatly to the salable value of what was left untouched

and unoffered, nearer the centre.

 Springfield street.

 1868
 12 cents.
 1869
 6 cents.

 1876
 20
 1871
 10
 10

These lands were included in large farms, extending to the river, part of the original purchase, and not exceeding \$100 per acre.

EVIDENCE FOR THE DEFENCE.

Mr. BUTLER. I will not trouble you, gentlemen of the Commission, by making any opening of the case, because I only propose to call two witnesses to a single fact, for the purpose of raising a question of law.

ISRAEL COLSON. — Sworn.

- Q. (By Mr. BUTLER.) Where do you live?
- A. In North Billerica.
- Q. Near to the Billerica mill, now worked by Mr. Talbot?
- A. About three minutes' walk.
- Q. May I ask your age?
- Å. 73.
- Q. Have you lived there all your life?
- A. No, sir.
- Q. When did you first go to Billerica?
- A. About 1820.
- Q. Have you lived there ever since?

A. Yes, sir, when at home.

Q. Had you ever anything to do with the Middlesex canal?
A. I was employed by the proprietors for a number of years.

Q. From what time to what time?

- A. From 1822 to 1852. Q. In what capacity?
- A. As carpenter, and repairing the locks, the former part of the time. The latter part I had charge of the work, -care of the water and the wood-work.
 - Q. General charge of that place? A. General charge; yes, sir.

Commissioner Francis. Charge of that part of the canal, I suppose, — not the whole?
Mr. BUTLER. Yes, sir.

- Q. What dam was used when you first came there the one that is now there, or another one?
 - A. No, sir, the old dam. There was an old leaky dam there.

Q. How was it made?A. The back and lower side was built up of stone—cobblestone, — and piled in front and gravelled.

Q. Was there a grist-mill there then?

A. Yes, sir.

Q. Any other mill?

A. A saw-mill.

Q. Any other?

- A. Faulkner's mill was on the other side. Q. Any one of the mills standing now?
- A. A part of Faulkner's. Q. What was that then?A. A woollen mill — flannel.

Q. What right had Faulkner then to the water superior to the grist-mill, or who had the first right?

Mr. Merwin. Wait a moment. It is hardly competent for this witness to state, as far as appears.

A. The mill had the first right.

Mr. Storrow. I have the deeds here, if it is desirable to prove those facts.

Mr. Merwin. It is immaterial to the Essex Company. It may be material to some of the others; but still it is not to be proved by this witness.

Mr. Butler. He was the man who had charge. But I will put it in another form. In what manner was the water used, as to who had the first right?

Mr. Merwin. The latter part of the question is objectionable; the first is not. He can say how the water was actually used.

Q. Well, go on and state how it was used.

A. It was used by the town for the town grinding.

Q. Who used it next?

A. The proprietors of the Middlesex Canal.

Q. Who next?

A. Faulkner.

Q. Did that state of use continue from 1822 to 1852, about the time when the canal was stopped?

A. Yes, sir; I believe it did.

Q. Now, sir, when was the present dam built?

A. In 1828.

Q. At the height it is now?

A. Yes, sir.

Q. Prior to the building of the present dam was there an insufficiency of water for the uses of the canal in the dry months?

A. At some seasons there was not enough without taking the

whole, except the grist-mill.

Q. Was the new dam raised higher than the old one?

A. Not to my knowledge.

Q. Whether it was effectively higher, by being tighter, and

keeping the water back higher?

A. I cannot tell as to that. I worked on the dam all the time it was being built. We had a mark to go by to lay the stone and put the flash-boards, so as to raise the water to the same height.

Q. Now, sir, during the dry season did the canal use substan-

tially all the water in filling itself up and down?

A. There were times when they required all the water there was in the stream.

Q. And then would they be short?

A. I have known boats to ground with a full load.

Q. Whether you fed both ways from that pond — both into the Merrimack and down to Charlestown?

A. Yes, sir.

Q. Do you know where the fordway is, as it is called, just above the pond?

A. I do.

Q. Whether the Middlesex proprietors found it necessary and did in the summer dredge out this fordway, or cut the weeds, so as to let down more water, in the dry seasons?

A. I have known them to mow the weeds — mow the grass.

Q. To let down more water, or to get the hay?

A. That was their object, to get more water. The weeds grew so thick that they effectually danmed the water up.

Q. How much did the water, in the dry season, flow over at the

fordway?

A. I cannot tell.

Q. Can you give us any idea how deep it was?

A. Well, it was so you could wade across there — perhaps eighteen inches, as nigh as I can tell. I never measured it.

Q. How wide would it be eighteen inches deep?

A. One hundred feet, for a guess. Q. When was Whipple's lock put in?

A. I don't know exactly the year; still, I built it; but it was somewhere about 1838 or 1839.

Q. Did you know of Mr. Whipple at any time during his lifetime making any claim for damages upon the canal for taking the water?

A. No, sir.

Mr. Merwin. That is immaterial.

Q. I should like to get some of these facts, Mr. Colson, with a little more definiteness, if I can. For how long a period in the summer would you use the whole water, and how many summers, say one in eight, one in six, one in four, or however it was?

A. I cannot tell; I never made any account of it; might be three or four in ten that they required all the water which they

were entitled to, I suppose.

Q. Three or four years in ten?

A. Three or four summers, some part of the summer. Some seasons they were not troubled.

Q. And for how long a period during the summer, some sum-

mers?

A. Oh, I have known it to be pretty dry, known them to be pretty short of water for six weeks — from three to six weeks; I mean short, so that the mills could not run; I don't mean that the canal would be so that they could not boat.

Q. That is, so short that substantially all the water went down

the canal, one way or the other?

A. Yes, sir.

Q. (By Mr. Merwin.) You don't mean that the grist-mill could not run?

A. No, sir.

Mr. Butler. The grist-mill could run first, if anybody had anything to grind.

Q. When they were short of water in the canal, did they use to

run the grist-mill at all?

A. They always ground the town grinding for the town, if the grain was there, and they requested it.

Q. Didn't they sometimes send it to Boston to be ground?

A. Not the town's grain.

Q. Not the town's grain; but other people's grain, who brought

it there to be ground?

A. Mr. Hale carried on the mill there once, and bought grain and carried it to Lowell when he was at Lowell market, and he might—

Q. (By Commissioner Russell.) What do you mean by "the

town's grain"?

A. I mean for the people of the town. The town had the right, previous to anybody else, to have their grain ground.

Cross-examination.

Q. (By Mr. Storrow.) What is the width of the Middlesex Canal, or what was it at that time?

A. About two rods on the surface.

Q. What was the depth?

A. There were various depths; but they required about $3\frac{1}{2}$ feet of water for a full-loaded boat -3 to 4 feet depth of water.

Q. Where did the canal enter ino the Merrimack river — at the part of the river above the locks and canals' present dam, or below it?

A. Yes, sir, above that dam, at Middlesex village.

Q. About how far from Billerica?

A. About five miles above North Billerica.

Q. And how long was it from North Billerica to Boston?

A. Twenty miles.

Q. Has the canal been used any since 1852 for purposes of navigation?

A. I think not. I think it was closed to navigation in 1851; but still I was employed on part of it in 1852 by the company, to

see to their bridges.

Q. Do you know whether the canal has been allowed to fill up, the gates to rot away, and the banks to cave in, or has it been kept up in good order, so as to let the water run in now?

A. I don't know of its being filled up - any part of it. It is

open now; the portions that I know.

Q. But you have never been through the whole length of it since then?

A. No, sir.

Joseph Tilton. — Sworn.

Q. (By Mr. Butler.) You live in Lowell, Mr. Tilton?

A. Yes, sir.

- Q. When did you come to Lowell? A. I came to Lowell in 1835.
- Q. And have lived there ever since?

A. Yes, sir.

Q. What is your age, Mr. Tilton? A. 59,—about that.

Q. What was the first work you did when you came to Lowell, the first employment you had?

A. About the first work I did was what they called refining salt-

petre.

Q. You went to work for Whipple?

A. Yes, sir.

Q. He carried on powder works at what is now the Wamesit power?

A. Yes, sir.

Q. When did Mr. Whipple build or rebuild the dam there?

- A. I think he built one the second year I came there in 1836 – a wooden dam.
 - Q. Was there a dam there before?

A. Yes, sir.

Q. An old dam?

A. Yes, sir.

Q. It had the powder-mill running on it then?

A. Yes, sir.

Q. Have you been employed about that dam or in the workshops connected therewith ever since?

A. I have.

Q. And are so employed to-day?

A. Yes, sir.

Q. From the time you first came there and knew about the water, say at the time when the new dam was built, if that was the time, as long as the Middlesex Canal run, how was the water of that privilege in the summer?

A. About June, July and August, sometimes it was very low—

very low indeed.

 \check{Q} . Whether you would have water enough to run the mills at all at such times?

A. Hardly any. We used to get a little nights; rather more

than we did days.

Q. Whether that state of things continued as long as they worked the canal?

A. It did.

- Q. After they shut up the canal, how did the water compare in the summer with what it was before?
- A. When the water was high we couldn't tell; but in a dry time we could get a good deal more. We used to get a pretty good supply of water.

Q. How has the water been up to this time? Has it been

increasing?

A. It appears to me that we have had more water for the last few years than we had previous to that. It appears to me that it is rather on the gain.

Q. Rather on the gain, even since the canal has been filled up?

A. Yes, sir, since they filled up the canal.

- Q. Do you know whether Mr. Whipple had a reservoir anywhere?
- A. I don't think he had. I don't know, but I don't think he had.
 - Q. Do you know Magog pond?

A. I don't.

Q. Now, sir, in the dry time, does the amount of water used by the mill at the Wamesit dam draw it completely down at night?

A. It does.

- Q. Whether it fills up during the night so as to rnn over the dam?
- A. Sometimes it does, and sometimes it does not; sometimes they run mills there at night, and sometimes they don't.

Q. Suppose they should shut down?

- A. If they should shut down, it would fill up; but sometimes in a dry time it is not filled up.
- Q. Is there any considerable pond for the storage of water between the Wamesit dam and the Billerica dam?

A. Yes, sir, there is considerable of a pond.

- Q. About how far is it from the Billerica dam to the Wamesit dam?
- A. I don't know as I know how far it is. I believe they call it about three miles.

Q. Do you know whether the dam flows back to the Billerica

privilege from the dam at Wamesit?

A. Well, I think that when the water is high it backs back. It might back up pretty near the mills when the water is low; I shouldn't think it would.

Q. In a time of low water, when is your shortest time for water?

What time in the week, or what time in the day?

A. Well, Monday morning, about ten o'clock, is the worst time we get, and then it keeps getting lower until night, when the water is low. We do not get any from Billerica until about noon, about twelve o'clock. That helps considerable in the afternoon.

Q. That is, if I understand you, the pond on Monday morning is drawn down by the mill before the Billerica water comes down?

A. Yes, sir.

Q. (By Commissioner Russell.) You say at twelve o'clock you

begin to get the water from where?

A. From Billerica mills. That is what we think; that we receive the benefit of that water about twelve o'clock.

Cross-examination.

- Q. (By Mr. Storrow.) How far is it from the Billerica dam to the Wamesit dam?
 - A. About three miles.
- Q. And you think it takes the water until twelve o'clock to get down there?
- A. I think it takes until about twelve o'clock to get there; it is a pretty dead stream.

Mr. Butler. I now put in chapter 203, acts of 1860, 11th Special Laws, p. 109, "An Act in relation to the proprietors of

the Middlesex Canal, approved April 4th, 1860.

- "Whereas, The Supreme Judicial Court of this Commonwealth, on the third day of October last, upon an information filed by the Attorney-General, pursuant to a resolve of the last Legislature, by a judgment and decree, declared that the Proprietors of the Middlesex Canal, or any persons pretending to hold the privileges, franchises and liberties of said corporation, do not, in any manner, have, hold, use, exercise or enjoy the said privileges, franchises and liberties, under and by virtue of any authority conferred by any act of the General Court of this Commonwealth, and that said Proprietors of the Middlesex Canal be absolutely prejudged and excluded from having, holding, using, exercising or enjoying said franchise, privileges and liberties. Now, therefore,—
 - "Be it enacted by the Senate and House of Representatives, in General Court assembled and by the authority of the same, as follows:—
- "All the privileges, liberties and franchises granted or given by the twenty-first chapter of the Acts of the Legislature of the year one thousand seven hundred and ninety-three, incorporating said proprietors, or by any subsequent acts in addition thereto, are hereby declared seized into the hands of the Commonwealth, forfeited and annulled, in consequence of the non-feasance and misfeasance of said corporation, and the neglect of their corporate duties, in accordance with said judgment and decree."

[See also agreed facts put in by the city on p. 69, supra.]
Mr. Butler. I believe that is all in the way of evidence that we have.

Mr. Storrow. We have something in reply. We put in the "Resolve concerning the Middlesex Canal," chapter 38 of the Acts and Resolves of 1859, approved March 29th, 1859:—

"Resolved, That the attorney-general be, and hereby is, directed and empowered to institute and prosecute an information in the nature of a quo warranto, or other suitable process, against the proprietors of the Middlesex Canal, requiring said corporation to appear before the justices of the Supreme Judicial Court, at a proper term thereof, to show cause, if any said corporation have, why the charter of said corporation should not be adjudged to be forfeit, and that all due proceedings and decrees in the premises before our said court be had."

I put in now a certified copy of a decree of the Supreme Court of Middlesex County, dated April term, 1859:—

COMMONWEALTH OF MASSACHUSETTS.

Middlesex, ss. At the Supreme Judicial Court of the Commonwealth of Massachusetts, begun and holden at Lowell, within and for the County of Middlesex, on the second Tuesday of April, being the twelfth day of said month, Anno Domini 1859.

Be it remembered that Stephen Henry Phillips, Attorney-General of said Commonwealth, who prosecutes for said Commonwealth in this behalf, by virtue and authority of a Resolve of the General Court, approved by the Governor on the twenty-ninth day of March, in the year one thousand eight hundred and fifty-nine, entitled "Resolve concerning the Middlesex Canal," comes here and gives this Honorable Court to understand and be informed, that the defendants are a corporation duly established by law of this Commonwealth, approved on the twenty-second day of June, in the year one thousand seven hundred and ninety-three, entitled "An Act for incorporating James Sullivan, Esquire, and others, by the name and style of the Proprietors of the Middlesex Canal;" that said defendant corporation have a usual and established place of business at Charlestown, in said county of Middlesex; that said defendant corporation, by virtue of said act and the several acts in addition thereto, became entitled to have, exercise and enjoy all the rights, powers, liberties, privileges, and franchises by said acts given and granted, and subject to all the duties, liabilities and restrictions therein set forth; that in and by said above-entitled act, the said defendant corporation became and were fully authorized and empowered to construct and maintain a canal from the waters of the Merrimack river, in said county, to the waters of the Medford river, in said county, and other canals in said several acts described; that the said defendant corporation did construct, and for a long time thereafter, to wit, until the first day of June, in the year one thousand eight hundred and fifty-three, did maintain a

canal from the waters of the said Merrimack river to the waters of the Medford river aforesaid, in said county, as by force of the said acts they were authorized and empowered to do, and until said lastnamed day said defendant corporation continued to use and exercise the several rights, powers, liberties and franchises aforesaid. And said Attorney-General further gives this Court to understand and be informed, that since the day last aforesaid, and from that day to the time of filing this information, said defendant corporation has wholly refused and neglected to maintain said canal, and has sold and conveyed divers portions of the real estate theretofore holden by said corporation, and necessary to be holden by them for the purpose of maintaining said canal, and have used parts of said canal and the waters thereof for uses and purposes for which they were not authorized by law to use the same; that for a long time past, to wit, for the period of three years before the filing of this information, they have wholly ceased and neglected to hold meetings and choose officers of said corporation, and to transact business as a corporation, or to use and exercise the rights, powers, privileges, franchises and liberties aforesaid, or any of them, as by law they were authorized and required to do, to the great injury of the said Commonwealth. Whereupon the said Attorney-General of the said Commonwealth prays advice of the said Court in the premises, and due process of law against the said Proprietors of the Middlesex Canal in this behalf, to be made to answer and show cause, if any they have, why the rights, privileges, franchises and liberties given and granted them as atoresaid, should not be adjudged to be forfeited by reason of the non-feasance, non-user, mis-feasance and neglect aforesaid; and that said defendant corporation may further make answer by what warrant they claim to have, use and enjoy, the rights, powers, privileges, liberties and franchises last aforesaid, said defendant corporation having forfeited the same, by reason of non-feasance, non-user, mis-feasance and neglect aforesaid. This information was presented to this Court, in the County of Suffolk, at the March term last, when and where it was ordered, that notice should be given to the said Proprietors of the Middlesex Canal to appear before the Justices of this Court, to be holden at Lowell, within and for the County of Middlesex, on the first Monday of September, then next, by adjournment from the second Tuesday of April instant, by serving them with an attested copy of said information, and of this order thereon thirty days at least before said first Monday of September next, that they might then and there answer to said information, and show cause according to the prayer thereof. And now the information is entered in this Court, and it appears that notice has been given, pursuant to the order aforesaid, but the respondents do not appear. afterwards, to wit, on the third day of October, A. D. 1859, all and singular the premises being seen and understood: It is considered by the Court here that the said Proprietors of the Middlesex Canal, or any persons pretending to hold the privileges, franchises and liberties of said corporation, do not, in any manner, have, hold, use, exercise or enjoy the several franchises, privileges and liberties in said information specified, under and by virtue of any authority conferred by any act of the General Court of this Commonwealth, but that the said proprietors of the Middlesex Canal be absolutely forejudged, and excluded from having, holding, using, exercising or enjoying said franchises, privileges and liberties; and that the said Commonwealth recover costs against the said proprietors taxed at

(April 3, 1860, three months after judgment. Plaintiff's vouch-

ers not filed.)

In testimony that the foregoing is a true copy of record, I hereto set my hand and affix the seal of said Supreme Judicial Court, this seventh day of July, A. D. 1876.

JOHN J. SAWYER,

Assistant Clerk.

I also put in the deed of Thomas Richardson, to the Middlesex Canal, dated March 25, 1794, recorded in Middlesex Deeds, book 115, page 258.

Commissioner Russell. That deed you put in by reference to

a volume.

Mr. Storrow. I have the book here; I have not a certified copy, but I think this is a certified copy which Gen. Butler put into one of the Sudbury-river cases.

Mr. Butler. Yes; that is a true copy.

Mr. Storrow. I read it from House Document No. 100, January 28, 1860, "Report of the Joint Special Committee upon the subject of the flowage of meadows on Concord and Sudbury rivers." I put in with that the vote of the town which is referred to in that Richardson deed, as the source of his title, and as containing the conditions under which he conveys, and which is found in Appendix B, page vi. of the report.

[From the Records of the Town of Billerica.]

(Vol. II., p. 276.) "At a general Town Meeting, Oct. 4th, 1708. Granted to Christopher Osgood, Jr., of Andover, all that neck of land on the west side of Concord river, lying between said river and the pathway leading to broad meadow, with the stream at the falls, reserving ten poles from the fordway down said river, and from the foot of the hill going down into broad meadow; provided the said Christopher Osgood do, within two years next ensuing the date hereof, erect and maintain a good grist-mill upon said river, at the falls over against Samuel Rogers his house lot, and the said Osgood doeth engage to secure and defend the town of Billerica from any trouble and charge that may arise for damage that may be done to the meadows of the towns above, as by said mill-dam; the said land is given and granted to the said Christopher Osgood and his heirs, by the town of Billerica, so long as he and they shall maintain a good gristmill at said place; and when said mill ceases, the land shall return to the said town of Billerica."

I also put in the deed of the Middlesex Canal Company to Francis Faulkner, dated May 4, 1825, recorded in Middlesex Deeds, book 260, page 48; page 50 of the same volume, Appendix M. The material part, which I will read, is this:—

"And the said corporation do also grant by these presents unto said Faulkner, his heirs and assigns, the privilege of using the water which passes through one-half of the creek leading from the mill-pond to the fulling-mill in the channel, as it now runs under the mill now in the possession of said Faulkner, for the purpose of working said mill and factory, as it now is connected therewith, whenever the exercise of such privilege shall not deprive the grantors or their assigns of an ample and sufficient supply of water at all times, and for all purposes and occasions, not exceeding, however, the quantity which is, or may be, requisite for the Middlesex Canal; and to carry the grist-mills and saw-mills of said grantors as they now are, whether used by the grantors or others to whom they may choose to sell or dispose of the same, for the same or any other purpose." Then it fixes an arbitrary standard of height below which he may not draw, which was the origin of the "bolt" that has been referred to.

"And the said grantors also reserve the right to use the water in the mill-pond in any quantity, and for any and all purposes whatsoever, when the quantity in said pond is so great as to flow over the dam, as well as to drain the whole pond, if necessary, for

the purposes of the canal."

I also put in the deed of the Middlesex Canal Company to C. P. Talbot and others, recorded in Middlesex Deeds, Book 618, p. 87, dated Sept. 22, 1851, Appendix N, p. liv.

Mr. Butler. Will you read the whole of that deed?

Mr. Storrow. I will read it if you want it, but there are six

pages of fine print.

Mr. Butler. Well, begin at the beginning, and read a little in. Mr. Storrow [reading]. "Know all men by these presents, That the Proprietors of the Middlesex Canal, a corporation established by authority of the Commonwealth of Massachusetts, in consideration of Twenty Thousand Dollars, paid by Charles P. Talbot, of Lowell, and Thomas Talbot, of Billerica, in the County of Middlesex, and Commonwealth of Massachusetts, manufacturers and copartners, the receipt whereof is hereby acknowledged, do hereby bargain, sell, remise, release, and forever quitclaim unto said Charles P. and Thomas Talbot, their heirs and assigns, eleven pieces or parcels of land, lying in the town of Billerica, in said county and commonwealth, subject, however, to the use hereinafter mentioned, as follows."

Then there is a description of the land conveyed, the deed, including the land under and adjoining the canal itself, reserving the

easements, which are specified.

"To have and to hold the above-released premises, with all the privileges and appurtenances, excepting as aforesaid, to the said Charles P. and Thomas Talbot, their heirs and assigns, to their sole use and behoof forever; but upon the express condition that the said grantees shall perform all the duties and obligations towards the town of Billerica, which the said grantors are bound

to perform by virtue of the vote of the inhabitants of said town, referred to in the deed of said Thomas Richardson, and all other conditions set forth in said deed; and also that the grantees shall not, whensoever forbidden so to do by said corporation, in writing, signed by their agent, and until said canal shall be lawfully discontinued, draw the waters of said river lower than three-fourths of an inch below the tops of the flash-boards on the stone dam (the lawful height of said flash-boards being fixed by the top of an iron pin driven into a fast rock at the side of the river near said dam, which is to be referred to, to determine the point below which the said waters shall not be drawn), and on the further condition, that the said grantees shall, after the discontinuance of said canal, either maintain and keep in good repair, at their own expense, the two canal bridges southerly of the Concord river, adjoining lands above described, or else shall take down the said bridges and fill up said canal under the same, and make thereon in the place of said bridges a good and sufficient roadway, to the satisfaction of the town of Billerica" (if you will look at the charter of the Canal Company you will see that a certain obligation to maintain bridges is imposed upon them); "the said grantees to have for their own use and benefit all the stones and materials of which said bridges are composed. And the said corporation do hereby covenant to and with the said Charles P. and Thomas Talbot, their heirs and assigns, that the above-released premises are free from all incumbrances, except as aforesaid made or suffered by the said corporation, or any of its officers; and that the said corporation will warrant and defend the same premises to the said Charles P. and Thomas Talbot, their heirs and assigns, against the lawful claims and demands of all persons claiming by, through or under said corporation, except for breach of condition, as aforesaid, and against none other."

Mr. BUTLER. You see the reserved right is not to have the water drawn down lower than three-quarters of an inch below the top of the bolt. If I can find the bill of exceptions I will put that in.

Mr. Storrow. There is no bill of exceptions in this case.

I desire, as I have already said, that it should be distinctly understood that there are no exceptions in the case of the Essex Co. This case was not entered until after the appointments were made in the other cases, or at any rate was not returnable until after that day. I knew of the exceptions in the other cases, and although I had an opinion as to their value or want of value, I did not want to be troubled with unnecessary questions. I went to the court, on notice to the other side, with evidence to prove the case which Gen Butler says ought to be proved before the appointment of commissioners; there was no opposition, the appointment was made and there were no exceptions. Either those questions which are referred to were settled in our favor by that appointment or they are to be tried here, I don't care which; you cannot assess our damages without either assuming or ascertaining what are the rights that are damaged.

Mr. Butler. If that is so I object. I do not believe that this commission have anything to do with the trial of any question of

fact or of law, except so far as that question of fact or law is involved in the simple assessment of damages; but the court who have created your commission have decided otherwise. I want now and at all times to object to this class of questions; they have no business here; but the court have said that you shall decide them, and therefore you are bound as much by that as you choose.

Mr. Abbott. Brother Butler, what "class of questions"?

Mr. Butler. Such as questions of title, questions of right. I say you have no right to decide any question of law or fact, except such questions of law or fact as are involved in the question of damages simply. That is to say,—how much damage has been done to the rights of the parties, they being first ascertained by the court. And as illustrating that, I wish to call your attention to the several acts under which the city acted. The act of 1872, already put in for taking Sudbury river, refers for all procedure under the act to the Cochituate Act of 1846, which has also been

put in, and the sixth section of that act says: -

"The said city of Boston shall be liable to pay all damages that shall be sustained by any persons in their property, by the taking of any land, water, or water-rights, or by constructing of any aqueducts, reservoirs, or other works, for the purposes of this act, and if the owners of any land, water, or water-rights which shall be taken as aforesaid, or other persons who shall sustain damage as aforesaid, shall not agree upon the damages to be paid theretor, he may apply by petition for the assessment of his damages at any time within three years from the taking of the said land, water, or water-rights, as aforesaid, and not afterwards, to the Court of the Common Pleas, in the county in which the same are situate."

Then it provides how the petition shall be served, and says: "And the said court may, upon default or hearing of the said city, appoint three judicious and disinterested freeholders of the commonwealth,"—which freeholders you are,—"who shall after reasonable notice to the parties assess the damages, if any, which

such petititioner may have sustained as aforesaid."

Now, you will observe, in the first place, that provision is made for the payment of all damages to land and water rights. Secondly, provision is made as to how the damages shall be assessed, subject to this limitation, which is in the first section: "The city of Boston shall, within sixty days from the time they shall take any lands, or ponds, or streams of water, for the purposes of this act, file, in the office of the registry of deeds, for the county where they are situate, a description of the lands, ponds, or streams of water so taken, as certain as is required in a common conveyance of lands, and a statement of the purpose for which taken, which said description and statement shall be signed by the said mayor." Then there is another special provision made when water is taken alone. The first provisions apply to the taking of land and water both, or either.

"Sect. 8. No application shall be made to the court for the assessment of damages for the taking of any water-rights until the water shall be actually withdrawn or diverted by the said city,

under the authority of this act; and any person or corporation, whose water-rights may be thus taken and affected, may make his application aforesaid at any time within three years from the time when the waters shall be first actually withdrawn or diverted as aforesaid." And then the other section, "and not afterwards."

Those are the provisions under which the city has done what it has been shown to have done, and under which this proceeding has been brought; and there are, as we claim, three or four matters which must be conditions precedent to the maintaining of this petition: First, the city must do the acts required by the statute to protect themselves for any doings of theirs under this act. They must first, in the case of water, have withdrawn the water from the party injured, or some portion of it. Next, they must file a statement, within sixty days from that time, of the land to be taken, describing the land that they take with the certainty of a common conveyance; and if they do not, the remedy of the party aggrieved is at common law, as in the case of any trespass. Third, there must be a demand made upon the city, or notice to the city, by anybody who is aggrieved, or who believes himself aggrieved, by the action of the city, before a complaint can be filed, in order to give the water commissioners of the city a chance to agree with him, after he makes his demands, and say, "We will pay it;" because you will observe that the statute says that the petition shall be filed in person. "If the owner of any land, water, or water-rights, which shall be taken as aforesaid, or other person who shall sustain damages as aforesaid, shall not agree upon the damages to be paid therefor, he may apply, by petition, for the assessment of his damages." Of course the object of that was, that the city, when engaged in a great public work, should be notified, at least, of a claim for damages before they were brought into court. This provision peculiarly applies to this case, because I do not think it entered into the wildest conjecture of those men that they were going to injure the Essex Company. They were aware that they were going to take some water up in Sudbury; but if I had been asked, originally, I should have said that the salmon at the mouth of the Merrimack, who were deprived of their necessary quantity of fresh water, would have had as good ground of claim against the city for the taking of that water as the Essex Company. And such I shall endeavor to show is the law, if I can.

Now, in this case there is no evidence whatever of any demand made upon the city, or any statement of damages, or any notification that any damages were expected. I have not the report in the books—it is not yet published—but it appears here, from the documents put in, and from what you have seen, that in 1872 the Water Commissioners of the City of Boston undertook to open Farm pond, and dig a channel from that pond into Lake Cochituate, and take water, and they did so. The Wamesit Power Company, believing that that was not authorized by the act—that they had not done the things prescribed by the act—brought a suit at common law against the Water Commissioners personally for a tort—trespass on the case—and that matter went for adjudica-

tion to the Supreme Court. I hold in my hand a statement of the case. The city came in and assumed the act of the Water Commissioners, and undertook to justify it, and to show that the commissioners had authority to do as they had done. They admitted that they had received the water. That case went to the Supreme Court, and, on an agreed statement of facts, the Court decided that that proceeding of the Water Commissioners was wholly unauthorized by law, and that they were individually responsible, and gave judgment for the plaintiff. That opinion is going through the press now, and I will have a copy of it given to the commissioners before they finally decide this case.

Commissioner Russell. Is it agreed that the agreed facts in

that case are to be taken as facts in this case?

Mr. Storrow. Not at all. We do not know anything about that case.

Mr. Butler. Very well. I do not care what the facts were. The facts in this case are before you. If they do not want all the facts, we can get along quite as well without them as they can, I guess. The only taking that has been proved here before you was by the surveyor, Mr. Frost, who swore that he saw the water running, in 1875, in the old ditch dug by the commissioners. That is the only way in which he had seen any water taken, and that is the only evidence that any had been taken, prior to the filing of this petition. There is no other evidence before you, except what Mr. Frost said last night. I am willing that all the facts shall come in; but, if I am to be restricted, then I choose to restrict the other side to the evidence. There is no evidence before you, I repeat, that before the filing of this petition one gill of water was taken by the city except from this dug-out rom Farm pond. But that was done by the Water Commissioners of the city, and it is not included in the written paper which was filed here in January, 1875. There stands the fact before you. that we show that the filing of this petition was wholly premature, and that the remedy is not by this action.

To show that you are to pass upon these questions of law, I will read the exceptions in the case of Charles P. Talbot and

others vs. The City of Boston.

[Mr. Storrow. That has nothing to do with our case.]

"Commonwealth of Massachusetts.

Middlesex, ss.

December Term, 1875.

CHAS. P. TALBOT ET ALS. vs. THE CITY OF BOSTON.

"This case came on to be heard before the judge, without jury, upon a motion made by the petitioners for the appointment of a committee to assess damages under the statute, and the respondent claimed that before the motion was entertained he had a right to be heard upon the issue raised by the answer. This claim the court overruled.

"The complainant then read his complaint, and put in papers marked 'A,' 'B,' and 'C,' hereto annexed, and rested his case. It was admitted that the petitioners had been in possession of the

land and premises described in their petition, and also of the water of the river used for more than three years prior to the filing of petition and still were in possession thereof, to drive mills on said lands, and that the Water Board of the City of Boston, claiming to act as the agent of the respondent, and to act under the authority of the Act of the Legislature of 1872, but without any vote of the City Council, between the 19th of June and the 17th of September of that year, had conveyed, by a temporary channel into Lake Cochituate, more than sixteen hundred millions of gallons from Sudbury river, and that respondent since the date and record of paper marked 'A,' had actually conveyed into said lake several millions of gallons from said river for use of city; but it was denied that the petitioners had any ownership of said water rights. Said petition and the answer thereto are to be referred to as a part of this bill."

Mr. Abbott. Is there not a statement in that case that they

took the water again in January, 1875?

Mr. BUTLER. Very likely. I do not mean to controvert that.

That is of no consequence; it is not evidence.

"The respondent objected to the insufficiency of the evidence on the part of the complainants to maintain their case, offered to prove the facts alleged in his answer, and claimed that the issue raised by the pleadings should be at first determined by the Court or jury, before the appointment of the committee; but the Court ruled that the respondent was not entitled, at this stage of the case, to be heard to establish his answer by any facts, or to maintain the allegations which show the want of title in the complainants to the water claimed to be taken, or any other facts in answer to the complainants' petition to show why it could not be maintained, and that it was the duty of the Court to appoint a committee without any hearing on the part of the respondent on the merits, and against the objection of the respondent appointed said committee; to all of which the respondent objected, and feeling aggrieved at the ruling and action of the Court, excepts thereto, praying that his exceptions may be allowed."

Therefore, I say, I suppose you will feel yourselves called upon

to pass upon these questions of law, so far as to report them.

ARGUMENT OF GEN. BUTLER FOR THE CITY.

Now, then, the first objection which I make to the assessment of any damages in this case is, that all this water, much more than we take, was, at the time when these petitioners took their title to water, in 1846, granted to the Middlesex Canal Company, for a public use, and was then in a public use, and remained subject to that public use until April, 1860, when by an Act of the Legislature, following a decree of the Court, the corporation that had that public use, for non-user of that very water, had their charter taken away from them,

forfeited; and, as the Act said, all rights, titles, privileges and immunities they had were seized to the Commonwealth.

Now, I suppose I need not stop to argue the fact, that the Middlesex Canal, from the time it began, in 1804, down to 1854, when it stopped, diverted more of the water of Concord river than we take, at all seasons of the year when any question of damages arises here, for they do not claim that we take but one-fifth of the water of Concord river, upon any showing; and it is proved and admitted by the facts in Heard vs. Talbot, that in the dry season a great deal more, almost the entire water of Concord river, was taken down to Boston. True, a portion of it was diverted into the Merrimack river, - enough to fill five miles of the canal, as against twenty. That is, four-fifths of it went the other way, if we take the proportion by the length of the canal; but as the fall was very much greater, and there were a great many more locks down to Boston bay, of course a great deal more than even the proportion determined by the length in miles went in that direction. But I need not stop to discuss for a moment the question how much was diverted, because if there was any diverted, that raises all the questions of law as to rightful diversion.

They could claim no adverse use of this water under a twenty years' user, because no period of twenty years had elapsed between the time when the canal was shut down by law and the time when this water was taken by the city. It is true that the canal virtually stopped using the water in the fall of 1851, and there would be twenty years to the fall of 1872. But that question is foreclosed by the decision in the 7th of Gray, upon the facts which were put into this case, — Heard vs. Talbot, page 113. In that case, Heard, the meadow owner, came in and said, "The canal proprietors have stopped using this water, wholly disused it; they have abandoned their canal, and have sold out their waterpower to Mr. Talbot, and Mr. Talbot is using it as a millowner only, and not for the use which the proprietors of the canal paid damages to the meadow owners for, and therefore a jury never having passed upon the question of damages as and for a mill, the mill-owners now, the canal being wholly ended and done, and having been so for years, we have a right to proceed against the mill-owners." And the deed of the Talbots was made a part of the case, showing

that they had a quitclaim deed.

[&]quot;At the time of the abandonment of the use of their canal, and as a part of the winding up of their affairs, the proprietors sold all their land, and the residue of the water-power by them unsold,

raised by their dam aforesaid, to the respondents, by deed of quitclaim, subject expressly to the reservation of all easements and services necessary for or incident to the preservation or use of said canal for the purpose of navigation, and of all the rights of the public therein, until the same shall be lawfully discontinued; and the respondents have, since that sale, maintained and kept up the water by said dam for manufacturing purposes, and claim to use the same in such manner and to such extent as may suit their convenience for such manufacturing purposes, subject to said reserved right of said canal."

Those were the agreed facts. Now, when the Court came to deal with this, they said:—

"They hold their title to the mills and water-power raised by the dam, which causes the land of the complainant to be flowed, under the grant from the proprietors of the Middlesex Canal. By the deed under which they claim, the right is expressly reserved to the grantors to appropriate the water raised by the dam at all times, to the purpose of supplying their canal. It is therefore in the right of the canal corporation, and subject to this reservation, that the respondents claim to use and enjoy the mill privileges created by the dam, which is the subject of this complaint. Unless, therefore, the corporation have surrendered or lost the right to keep up and maintain this dam, it having been already settled in 5 Met., 81, that the complainant has no claim for damages on account thereof against the corporation, it would seem to follow that he has none against these respondents, who claim under the corporation.

"The sole ground on which he now rests his case is, that the canal corporation have, since the year 1851, wholly disused their canal, filled up portions of it, and suffered it to remain in such condition as to be entirely unfit for use. The argument is that the right of erecting and maintaining a dam was granted to the corporation, mainly for the purpose of enabling them to raise water for the supply of their canal; and the power to hold mills was wholly incidental to, and dependent on the appropriation and use of the water raised by the dam, for the great object for which the corporation, having abandoned the use of the canal, and ceased to supply it with water, can no longer claim the right under their

charter to maintain the dam.

"Admitting, for the sake of giving the full force to this argument, the correctness of the premises upon which it rests, we do not think the conclusion drawn from them legitimately follows; an essential link in the chain of reasoning is wanting. The argument assumes that the neglect or omission to use a right granted to a corporation as part of their franchise, for the specific purpose for which it was given, necessarily works a forfeiture of the right itself. But this is not so, unless the right is expressly made conditional on the use, which is not done in the act incorporating the proprietors of the canal. The right is given absolutely, and with-

out expression of condition or limitation. The corporation are still in existence. But the rights and powers conferred on them by law, and comprehended within the broad terms of their franchise, have never yet been legally forfeited or extinguished. Nor can they be, except by a surrender of a charter, and its acceptance by the government, or by a forfeiture declared by the judgment of a competent tribunal, or by proceedings under St. 1852, c. 55.

"In the absence of express conditions, in an act of incorporation, by which corporate rights and powers are made to depend on their due exercise, a non-user or mis-user of them does not operate as a surrender or forfeiture of the charter. Although the disuse of the canal, and its abandonment by the corporation, may be a gross disregard of the duty imposed on them by law, and an essential violation of the terms and conditions implied from the contract entered into with the government by the acceptance of the charter, and upon due proceedings had, might be sufficient ground upon which to decree a forfeiture of all their corporate rights and privileges, they do not constitute any valid ground upon which the exercise by the corporation of any of the powers conferred by their charter can be defeated or denied by third persons in collateral proceedings. This results from the very nature of an act of incorporation. It is not a contract between the corporate body on the one hand and individuals whose rights and interests may be affected by the exercise of its powers on the other. It is a compact between the corporation and the government from which they derive their powers. Individuals, therefore, cannot take it upon themselves, in the assertion of their private rights, to insist on breaches of the contract by the corporation as a ground for resisting or denying the exercise of a corporate power. That can be done only by the government with which the contract was made, and in proceedings duly instituted against the corporation. It would not only be a great anomaly to allow persons not partial to a contract to insist on its breach and enforce a penalty for its violation; but it would be against public policy, and lead to confusion of rights, if corporate powers and privileges could be disputed and defeated by every person who might be aggrieved by their exercise. Therefore it has been often held that a cause of forfeiture, however great, cannot be taken advantage of or enforced against corporations collaterally or incidentally, or in any other mode than by a direct proceeding for that object in behalf of the government.—Angell & Ames on Corp., § 777, and cases cited. Boston Glass Manufactory vs. Langdon, 24, 49. Quincy Canal vs. Newcomb, 7 Met., 276.

"It follows from these principles that the franchise of the proprietors of the Middlesex Canal, which includes the right of keeping up and maintaining the dam which flows the land of the complainant, being still in existence, it is not competent for him in this proceeding to show a non-user or abandonment of the canal as a ground for denying the right of the corporation to continue the dam; and as the respondents hold their title under the corporate franchise, there is no ground for sustaining the present complaint, under the mill act, against the respondents. It is a

sufficient answer to this suit that the corporation have the legal right to maintain the dam as against the complainant, without payment of damages. This view of the case renders it unnecessary to determine the question discussed at the bar, whether the right to purchase and hold mills, which was conferred on the corporation by the act of 1798, was the grant of an additional and distinct franchise of right, which may be used and enjoyed by the corporation or their grantees, separately from, and independently of, the building and maintaining of a canal; or whether it was merely secondary and subordinate to the making of a canal and the raising of water for its supply, and was to cease and become extinguished when the right of keeping and using the canal should be surrendered or forfeited. Nor have we occasion to decide whether the forfeiture or extinguishment of the charter of the corporation would operate to defeat the title of the grantees of the corporation to the mills and water-power which had been obtained by the corporation lawfuriy, and conveyed to the respondents by. deeds valid at the time they were made, by which the title became vested before such extinguishment or forfeiture took place. These are important and interesting questions; but it will be quite time enough to settle them when the exigency of the case shall require, in order to adjudicate upon the rights of parties, that they should be judicially determined.

Complainant nonsuit."

It is time enough to decide these questions when they arise.

Therefore, I say there can be no claim of any twenty years' user against the corporation, because the Court have distinctly settled that they have a right to keep them up or let them down, or do whatever they please with them.

Mr. Merwin. In what year was that decision?

Gen. BUTLER. That was in 1856. I shall have occasion to call the attention of the commissioners to the point, that a mill-owner below acquires no right in the water above on account of a mill above, and the fact that he owns the mill.

Now, then, I say that at the time that this act, granting the power to the Essex Company, was passed, and at the time they went into active operation, all this water was diverted to a public use, and remained diverted to a public use ever since, so far as they are concerned; and therefore they cannot say that they are damnified by the Commonwealth's having the right to it, and afterwards granting it to the City of Boston, subject to paying the damages. If it had not been for that grant, it is very clear that the City of Boston could not have taken the Sudbury river. And there, if your Honors hold with me, seems to be an end of this case, — because, I take it, nothing is clearer than that if the title of this water is in the public, it is not in the Essex Company.

We are now brought to the next question in this case for I propose rather to indicate the questions than to argue them. The next question in the case is, "What are the rights of the Essex Company, independent of this question about their subrogation to the Middlesex Canal?" They were granted the right to create a water-power - a very happy phrase, I agree with my brother, - to create a water-power on the Merrimack river, subject, however, to the rights of navigation in that river; because their charter provides that they shall keep a canal and locks around their dam, - and no dam has ever yet been granted on the Merrimack river, either in the State of New Hampshire or the State of Massachusetts, we say, that has not a canal and locks around it, — so that in the olden time, the Middlesex Canal, coming in around our dam, used to send its boats to Concord. Neither State has ever treated this river other than as a navigable river.

The original act incorporating the Essex Company made them a corporation, "For the purpose of constructing a dam across the Merrimack river, and constructing one or more locks and canals in connection with said dam, to remove obstructions in said river by falls and rapids, from Hunt's falls to the mouth of the Shawshine river, and to create a waterpower to use, or sell, or lease to other persons or corporations, to use for manufacturing and mechanical purposes."

That was the way that this act was got through the Legislature, evidently. People always put their best foot foremost, and the best hold of these people upon the Legislature was to say that they wanted to improve navigation ou the Merrimack river, and remove obstructions between Hunt's falls and the Shawshine; and then they wanted to put in that they wished to create a little more water-power to sell,—that they would have more than was necessary for navigation, and would like to sell a little. And then that same act authorizes this corporation to maintain a dam across said river at

"Some point in said river between said falls, and all such canals and locks as may be necessary for the purposes aforesaid; and for the purpose of making said dam, and constructing the main canal for navigation or transports, may take, occupy and enclose any of the lands adjoining said canals and locks or dam which may be necessary for building or repairing the same, for towing-paths and other necessary purposes, not exceeding twenty feet on each side of said canal or locks, and may blow up or remove any rocks in said river, and dig in any of the lands near to said river in which it may be necessary to pass said main canal: provided, that said corporation shall not obstruct the passage of rafts, masts or floats of timber

down said river, earlier than the 1st day of June, in building said dam, nor keep the same obstructed for a longer time than five months before the opening of said canal for the passage thereof."

And then, —

"For the purpose of reimbursing said corporation" (that was the way they were to get paid) "in part for the cost and expense of keeping said locks and canals in repair, and in tending the same, and in clearing the passages necessary for the transit of boats and merchandise and other articles through said canal, the following toll is hereby established and granted to said corporation."

And then follows the toll on all manner of articles; and then a provision was made how long the locks should be,—90 feet long and 20 feet wide,—all of which never has been altered; but, on the contrary, when the Legislature allowed them to spend their money up to Winnipiseogee, they took care to put in a provision (which my brother has taken care not to print), that they may spend

"Such sums of money as the said company may deem expedient in improving the power of the Merrimack river; and for this purpose the said company may, with the consent of the State of New Hampshire, acquire by purchase and hold real and personal

property within the limits of that State."

"The time during which the said company are authorized to obstruct the passage of rafts, masts or floats of timber down the said river is hereby extended for a period of one year: provided, however, that during the said year it shall be the duty of the said company to provide and keep in readiness for such purposes sufficient men and teams to transport all such rafts, masts and floats of timber around such obstruction in the river, so as to cause as little delay as possible in the navigation thereof."

And any person who shall suffer any damage by reason of

neglect shall have his remedy.

I agree perfectly that it was simply a "tub thrown to the whale;" but it shows precisely that the Commonwealth holds this to be a navigable river; and as all of your Honors know, there are locks around the falls at Lowell, and so on

up to Concord, N. H.

Now, then, what are the rights of a person as riparian proprietor, getting no other grant from the Commonwealth, or what are the rights of a company as riparian proprietor, in creating a water-power on a navigable river, or creating slackwater navigation on a navigable river? In the first place, do they get any more rights than any other riparian proprietor? I think not, but fewer. What are the rights of a riparian proprietor on a navigable stream? Are they they same, or other and different from the rights of a riparian

proprietor on streams not navigable? They are in many regards other and different. In the first place, on a navigable stream, a riparian proprietor cannot say to any man, "You shall not go up and down my land, and you shall not land on my land in any case of necessity or convenience." That is one of the different rights of a man holding land on a navigable stream. You cannot obstruct that stream as you can an unnavigable stream on your own land. never yet has been determined in this Commonwealth, as to the rights to the middle of the stream, in a navigable stream, or whether those rights do not stop with the shore, at the point where it is navigable. Now, then, building a dam by permission, to still keep the river navigable and to improve its navigability, does the riparian proprietor, having got that permission, for he could not do it without (on any other stream he could have done it without any permission); having got that permission to obstruct navigation, can he say to every riparian proprietor on every tributary of that stream, through its whole length, from the mountain spring that begins it, down to his dam, "You cannot divert any water from this river without paying me damages"? If the man that has got the dam, or the company that has got the dam on the river, has that right, every other riparian proprietor has the same right. And if we proceed here upon the theory that wherever there is an invasion of right there is a remedy, then every man that owns land on this stream, from the city's dam at Saxonville, down to Newburyport and Plum Island, has his right of action for the water that is diverted from Sudbury river; and not only that, but, theoretically, he has a right of action for every drop that is taken beyond the necessary use, — for I suppose I state correctly when I say, that all the rights at common law that a riparian proprietor above has, with respect to a lower proprietor, are to use so much of the water as may be necessary for his use, with due economy and care, and to restore it when used to the stream, for the use of the proprietor below, less only what is necessarily expended in that economical and proper use. Those I suppose everybody will agree are the rights of riparian proprietors above and below on a stream. I claim further, and I am happy to say that I have now got into something that has been settled in this Commonwealth, — I claim that every man on a stream, whether be owns land or not, - the inhabitants on a stream, — have a right to use the water for domestic purposes. My statement of rights would be like this: That the first right to water is for drink and domestic purposes, and that I, as an inhabitant of this Commonwealth, have a right to go down to the bank of every navigable

stream, at least, or to go down to any stream where I can get without trespassing upon land of my neighbor, and dip my cup in and take up as much water as I want to drink, and dip my pail in and take water to water my horse, or fill my tub and wash my shirt, and that I am not to be sued by any mill-owner for taking so much of his water. That I claim is the first right of any man. The second right is the right of navigation, - being a natural right, - the right of transportation. The third right is the right of the party who for mill-water purposes stores up the water. Now, I do not claim, Messrs. Commissioners, that I have any right to any water stored up by anybody else; and, therefore, my right as an upper riparian proprietor, or the natural right which I claim, or the navigable right which I claim, only affects the natural run of the stream. If anybody has built a dam and stored up the water on his premises, I have no more right to it than I have a right to the trout that he puts in the water and keeps there. But I have an equal right to the trout that run in the natural stream, as I have an equal right to the water in the natural stream. Therefore, you have no right to take more than the natural run of the river.

Now, then, if you go with me, —I don't ask you to go as far as these last propositions, for it is not necessary for this case; but at the same time I hope to see them established, and it is very necessary to have them established for the benefit of the citizens of the Commonwealth, for the cities and towns of this Commonwealth are going to need the water for common use, and if they have got to buy the natural run of the stream of every man who has got a mill, there simply will be trouble with mill-owners, if they insist upon their rights, — and I think it is best for all that they should not. And, fortunately for us all, the amount used for domestic purposes is very small compared with the amount required to run machinery.

Well, now, where is the limit of the use of these rights? Admitting that these riparian proprietors, with their dam at Essex, have a right to the water, I insist that they have no right to complain at all of any water taken above, because they are upon a navigable stream, where all have equal rights to the use of the water, like the great ponds of the Commonwealth. They are upon a navigable stream, and they have no right to complain of a riparian proprietor through whose land a little brook runs, from one to another,—no right to complain that the law which is made for the one is not applicable to the other. As I say, I am simply indicating the points, without stopping to argue them.

I come next to see where, — if they have any rights, —

where is the limit to the exercise of the right of reclamation of damages for interference; because it would be monstrous to agree to the proposition that every man can have this action.

Mr. Abbott. Every man who is injured —

Gen. Butler. Every man is theoretically injured by the taking of the water. I think we shall have to come to that; brother Abbott, at last, that a man must be appreciably injured before he can complain. That is my next proposition. That is the very point I am coming to, — that he must be appreciably injured; that he shall be enabled by some instrument known to human skill to measure his injury; that he shall be able to know it by night or by day; and both the engineer and Mr. Storrow admitted that there was no human instrumentality at present by which they could measure the amount of this water, or determine whether it was there or away.

This whole question has been very much discussed in the seventh of Barr's Pennsylvania Reports, page 348, in the case of Mayor vs. The Commissioners of Spring Garden. The syllabus of the case is very much stronger than I have

put the law:—

"The grant by the Legislature of an exclusive right to the water-power of a navigable stream does not pass a title to the corpus of the water, or prevent its use for the ordinary purposes of life."

"Hence, where the Legislature granted the privilege and title to all the water-power of the river Schuylkill, and made a subsequent grant to the districts of Spring Garden and Northern Liberties, of the right to erect works and supply their inhabitants with the water from the river — and such works were erected to be propelled by steam — such grant and the acts done thereunder are not in violation of the previous grant of the water-power."

There is where the Legislature, by express enactment, granted the exclusive right, — which they have not done here, by any means.

"The bill set forth that Robert Kennedy was authorized by the act of 1807, to erect a mill-race near the falls of Schuylkill, and draw so much water from the river as might be necessary for a grist and saw mill, provided that if the City of Philadelphia should at any time be desirous of erecting works to conduct the water of the river into the city, that right was reserved; but if such erections should injure the works of Kennedy, his expenses, with seventy-five per cent. addition, should be paid on his conveying his right to the premises. In 1810, Kennedy conveyed all his water-right to Josiah White in fee. That by the acts of 1815 and 1816 the corporation of the Schuylkill Navigation Co. were

incorporated, and authorized to improve the navigation of the river (between points, including that at which the present cause of the controversy is situated); and that corporation it was thereby declared 'should have the privilege, and be entitled to all the water-power from the said river, sluices, or canals; to propel such machinery as they may think proper to erect on the land; or they may sell in fee simple, lease, or rent for one or more years, the said water-power to any person or persons, to be used in such manner, and upon such terms, as they may think proper.'"

But you will see the difference.

"Provided it shall be so done, that it shall not, at any time, impede or interrupt the navigation; and the company shall apply the money arising from the sale to the improvement of the navigation, or repairing any damage that the locks or dams might have sustained.

"That, by the articles of agreement between the Navigation Company and Josiah White, the latter was authorized to erect a dam at the falls, and was vested with all the right to all the waterpower there created, which the company was entitled to grant; provided it was so drawn off as not to impede the navigation of the river or canal. That a part of White's interest became vested in Gillingham, both of whom, in 1819, conveyed to the corporation (plaintiff's), in consideration of \$150,000, all their right of water-power at the falls, and generally of and in all the waterpower of the river and all the rights acquired from the Navigation

Company.

"That, in the same year, the plaintiffs made an agreement with the Navigation Company, reciting that plaintiffs were desirous of increasing their supply of water for the use of the city, and for the purpose of vending the same to the adjoining districts, by means of an enlarged power to be obtained by a dam to be built near the water works, and that the Navigation Company were willing to give effect to the same. It was, therefore, agreed that the plaintiffs would erect a dam at Fairmount, to raise the water as high as was contemplated under the agreement with White, and that the Navigation Company were authorized to draw off as much as they thought necessary for the navigation, and that the plaintiffs were to enjoy the residue for the purposes mentioned, but not to sell, lease or dispose of any water-power, nor to use the water-power for manufacturing purposes. The plaintiffs also agreed to erect guard-locks, chambers, tail-race, toll-house, etc., for the company, and pay all damages occasioned by the erecting. of the works at Fairmount.

"That, in the year 1824, in consideration of \$26,000 paid to the Navigation Company, the plaintiffs purchased of them the right to take all the water and water-power that remained, after drawing off from the river so much as was required for the navigation, and to use and sell the same without restriction.

"That, upon the faith of these agreements, the plaintiffs had expended in the erection of the dam, machinery, etc., to supply the city and adjoining districts with water, upwards of \$1,000,000.

And that, under the authority of Acts of Assembly, they had contracted with the two corporations defendants to supply their inhabitants with water, and had complied with their agreements; but that the defendants had employed workmen, collected materials, and were about erecting buildings and machinery to take and use the water and water-power, of and from the pool formed by the dam at Fairmount. That the Act of 1843, under which they pretended a right, gave no such authority, because of the clause saving all the rights of the Schuylkill Navigation Company, and because no act could authorize the taking and use of the water without the plaintiff's consent, since it would be a violation of the tenth section of this constitution."

The answers set up that the defendants were simply desirous of using the water for the Northern Liberties and Spring Garden; and that perhaps is sufficient to enable the opinion of the court to be distinctly understood.

"His Honor, in ordering the injunction, said, with reference to the title of the complainants to the exclusive use of the water, after stating the general rules as to the rights of riparian owners of private streams, and that, though a public highway, the State could not in such case divert the water to injure the owners of the soil. But in the case under consideration the State owned the bed of the river at Fairmount dam and far above it, and, according to the principles already laid down, could originally have granted to any individual, or number of individuals, the exclusive right to navigate said river, which would have been the greatest privation to the public, in contemplation of law, at least, that can well be imagined; and, if so, it cannot be questioned that she may grant the whole use of the water for propelling machinery and putting manufactories into operation, or for supplying the citizens of Philadelphia with water for drinking, washing, and for all culinary purposes, reserving to the public a sufficient portion thereof for all the purposes of navigation."

Then an appeal was taken to another court, and it was very fully and thoroughly argued by lawyers of such fame that the difficulty of puzzling a Philadelphia lawyer has passed into a proverb, — for the appellants by J. M. Read and Mr. Dallas; for the appellees by Ormstead and Meredith.

Gibson was the Chief Justice, — and when Chief Justice Gibson speaks he generally speaks as much law as anybody. He says:—

"Notwithstanding the range which the argument has taken, the ground of this controversy lies in a narrow space. Instead of depending on general or constitutional law, the question before us depends on the interpretation of a short and isolated section of the statutes; but the quotation from the civilians and from Lord

Hale bear strongly upon it. They establish that the use of water, flowing in its natural channel, like the use of heat, light, or air, has been held by every civilized nation, from the earliest times, to be common by the law of nature, and not merely public, like the use of a river or a park, which is subject to municipal regulation by the law of the place. They establish also that the domestic uses of water are its necessary and primary ones. Air is not more indispensable to the support of animal or vegetable life. Water is borne by the air, in the form of vapor, to the remotest regions of the earth for the free use and common refreshment of mankind; and to interdict the use of the one within any particular locality would be as monstrous and subversive of the scheme of animal existence as it would be to interdict the use of the other. It is only when it has been received on the surface of the earth, not while it is falling from the clouds, that it can be made to minister to the ordinary wants of life; and, if it be common at first, it must continue to be so while it is returning by its natural channels to the ocean. No one, therefore, can have an exclusive right to the aggregated drops that compose the masses thus flowing, without contravening one of the most peremptory laws of nature. Water may be exclusively appropriated by being separated from the mass of the stream and confined in tanks or trunks; but then it would have ceased to be aqua profluens.

"It does not cease to be so, however, by being merely impeded in its natural channel by a dam. That a law of nature may be displaced by even legislative might has been stoutly denied by high authority, though perhaps without conclusive effect where the question is one of right and not of power; but where a court has to deal with a question of construction, and not of power, the protection of such a right from violation by superior force must always turn the scale. Nothing but the most clear and imperative expression of the legislative will could prevent it. What we have to do, then, is to see whether the Legislature has indisputably debarred all mankind from drawing water from the Schuylkill river, except by permission of the Schuylkill Navigation Company, or

the city of Philadelphia, its alienee.

"Now, a grant of water-power is not a grant of the water for anything else than the propulsion of machinery; and it consequently does not exclude the use of it by any one else, in a way which does not injure or decrease the power. It is not a grant of property in the corpus of the water as a chattel; and this does not seem to have been doubted by the judge who decided the cause below. A right may doubtless be granted, if a grant were necessary, to intercept running water, and confine it in reservoirs for separate use; but the grant of such a right would not be the grant of a water-power. No two things can be more distinct and dissimilar. The respondents, therefore, would not be answerable in equity for taking the free and running water of the river, or for anything less than a nuisance to the complainants by decreasing the volume and force of the current; for on no other ground could the extraordinary jurisdiction of a chancellor, which in case of nuisance is only the handmaid and protectress of the legal title, be invoked to restrain the diverting of a water-course. The authorities to the point are collected in Eden on Injunctions, c. 11, p. 157, in which it is shown that, though it is the practice to enjoin in clear cases of nuisance, without a trial to establish the right at law, yet the courts of equity are exceedingly unwilling to do so; and my first impression was that the injunction ought to have been refused on that ground. But granting for the occasion that the bill, answer, and proofs, establish the existence of an actual nuisance, yet as injunctions, without exception, are discretionary and grantable on the circumstances of the particular case, I am far from clear that it would not be our duty to leave the complainants to their remedy at law, until they could make out a case of substantial and appreciable injury to a part of their water-power, which they otherwise would have put in use; and no such injury is made out by the proofs.

"The estimates are, that about two millions of gallons are daily taken by the respondents from the pool, while from one hundred and fifty to five hundred millions are suffered, in the same time, to tumble over the dam. Whatever, therefore, may be the growth of the districts and their wants, it is pretty certain that the complainants will be free from actual damage from the respondent's works in all time to come. The number of the population at present is computed to be one hundred thousand; and should it in time be equal to the population of London and its environs, — a thing that is barely within the bounds of possibility, — the daily consumption, according to the present ratio, would be no more than forty millions of gallons; leaving an immense surplus, which the complainants do not, and probably never can, use."

He would seem to have had the Essex case in mind: -

"But should the case turn out, in process of time, to be otherwise, it would be time enough to apply the strong arm of a chancellor to it. But, according to Pastorius vs. Fisher, 1 Rawle, 27, a plaintiff is entitled to nominal damages from one who floods his land without actual damage, because every invasion of a right is, in contemplation of law, a constructive damage, calling for compensation in proportion to its importance. We must not forget, however, that an action is of right, and that an injunction is of grace. Viewing the case as if the complainants had established their right by a verdict at law, it would not follow that a subsequent jury, performing the office of a chancellor under our mixed system, as necessity has sometimes compelled them to do, would be bound, on the principle of Clyde vs. Clyde, 1 Yeates, 92, to coerce the respondents, by means of vindicatory damages, to abate their works.

"The preceding remarks have been hazarded on the foot of a momentary concession that the respondent's works are a nuisance in contemplation of law; but are they so? The affirmative must be rested on an assumption that any abstraction of the water for domestic purposes is a technical injury to the complainants' waterpower; and this, whether it were drawn from the pool or from the stream above; for the volume of the water would be equally lessened by it in either case. According to the argument it would be an infringement of the company's right to draw water from the river, even above the charter-ground. But is it possible to think that in granting the company authority to use or sell the power of the surplus water, the Legislature intended to appropriate the whole stream, for every purpose, to its exclusive use, and to debar the inhabitants of the contiguous villages and farms from using any part of it for drinking, cooking, washing, or any other domestic purpose? It would be monstrous to suppose it. The very extravagance of the pretension is an irresistible argument against it. The intent of the Legislature was to give the company a monopoly of the power incidentally created by its works, and to give it no more; for the words of the section go no further. The water in its pools was not to be drawn from them for application to machinery elsewhere without its consent; for that is the extent of the enactment, and it contains no express or implied prohibition of any other use of it. The river above the charter-ground was left subject to the common law, which allows every riparian owner to divert the stream for purposes of irrigation or power, subject only to return the residue of it to its natural channel on his own ground; yet even he would be liable, on the principle of the argument, for the least imaginable diminution or consumption of it. Even within the extent of the charter-ground there was to be no sacrifice of the natural and inherent rights to the merely collateral creation of water-power, which was not the object for which the company was incorporated, but merely auxiliary to it. Legislature would not have ventured to abridge a right so sacred to accomplish a subordinate purpose, however meritorious; and had the interpretation attempted been propounded to it as necessary and inevitable, the bill would certainly have been rejected. What, then, have the respondents done? The inhabitants of the districts might have lawfully dipped from the margin of the pool water enough for their several necessities; but, instead of drawing it by hand or by horses, they have combined their funds to produce a cheaper - a better transportation. True, they have laid pipes in the pool, as they might have laid them in the bed of the river had not the dam been erected; but what has that to do with the supposed production of an injury to the complainants by decreasing the volume and force of the stream? Certainly no more than the transportation of the water, when separated from the mass, has to do with it. Unless the complainants have a specific property in the water itself, — and all the writers on natural or conventional law agree that they have not, they have no equity. To state their case is to decide it. We are, therefore, compelled to differ from the opinion expressed by our late brother Kennedy, and to reverse his decree.

"Injunction dissolved and bill dismissed."

That, I think, sustains my view of the law in this case farther than you need to go. Here is no grant of water-power, but leave to create water-power out of the water flowing in the river, and not to take anybody else's rights.

Before I read the next case, I want to come to exactly what is proved here. It is now in evidence (and I have not seen occasion to controvert that evidence, but will try to state the fair result of it), that the Essex Company have a permanent water-power, which they can use,—if they get some-body to buy it,—up to 2,400 cubic feet per second. Beyond that it gets uncontrollable in surplus, and they say they do not even measure it; but up to 2,400 cubic feet per second they do. And that furnishes them 186 mill-powers of thirty cubic feet each. They have their capacity in the way they can use it, in twelve hours a day; and of course there are two-twelfths more if used only ten hours a day. Mr. Storrow says he thinks Mr. Mills has been by far too modest about it, and that they have got more. Well, I think they have too.

Now, the most that they claim is, that less than two per cent. of that is taken away from them,—that is the extent of their claim; by the water-shed—two per cent.,—one fifty-seventh part. Well, they come here and admit to you that it is impossible for them to measure how much they have got rid of, within three per cent.; that to tell whether they have

lost it or got it is impossible.

But that is not all; they admit that this two per cent. is not of any use to them nine months in the year, because they have a surplus which they never can use. Then the actual loss is to be one-quarter of two per cent., that is, for a quarter of a year, or a half of one per cent. That is the actual loss out of their water-power; a half of one per cent., upon the highest claim, too, you will observe. And they cannot measure within three per cent. at the lowest; and they are as skilled as anybody else. That they admit, and they testify that human ingenuity has not fixed it so that they can meas-

ure the gain at all.

But we do not stop there. That is upon an assumption that this old map has shown the water-shed of the river on one side, as against our new map on the other. Well, upon that evidence, the later maps give four hundred miles more water-shed than this old one does. I did not think to ask my young friend on which side of that water-shed line he put his dividers upon the scale on which this map is drawn. This line is so broad that if he had put them on the inside instead of the outside of that line, it would have made a difference larger in amount than the whole water-shed of the Sudbury river. If you take that broad line and measure from the inside of it, and not the outside, it will make all that difference in the water-shed.

But this is corrected by the fact that their engineer, Mr. Mills, says he don't think that in the summer time there is

more than forty-five cubic feet gets down there, which is, they say, a mill-power and a half, or an average of that. That is his largest estimate of the amount that they get down there. Well, their water-shed should call for two, and considerable more, and he could not quite come up to that; and they agree that there is a waste in their water-shed; that is his idea. But we have Mr. Storrow himself in connection with the water-shed (and they do not bring him to contradict it), we have Mr. Storrow himself charged with the duty of settling between these meadow-owners and Mr. Talbot as a commissioner of the State, sending there Mr. Mills and thirty other assistants, and reporting to the State that, reducing this river without the dam, and finding exactly what runs in it, they believe it is less than a hundred cubic feet a second in a dry season, and they say that that is a fair ordinary measure for the summer.

Is not that what they say? I believe I have stated it with accuracy. Now, then, Sudbury river is one-fifth of that, i. e., twenty cubic feet in the summer, that is, two-thirds of a mill-power, and they say they cannot measure within three per cent., — five mill-powers and some odd, — of what they have. If it was two hundred, it would be just six mill-

powers.

Now, is not this theoretical damage, gentlemen? And can you give this under a statute which says they shall not have it until the water is withdrawn from them and they are affected thereby? That is the point. Now, have they been affected by any draught of water yet? Is it not a misuse of terms to say that they have been affected by the use of water here?

"And if the owner of any land, water or water-rights, which shall be taken as aforesaid, or other person who shall sustain damages, as aforesaid, shall not agree upon the damages to be paid therefor, he may apply, by petition, for the assessment of his damages at any time within three years from the taking of the said land, water, or water-rights, as aforesaid, and not afterwards, to the Court of Common Pleas in the county in which the same are situate."

Then in the eighth section of the Act of 1846: -

"No application shall be made to the court for the taking of any water-rights until the water shall be actually withdrawn or diverted by the said city, under the authority of this act; and any person or corporation whose water-rights may be thus taken or affected, may make his application aforesaid at any time within three years from the time when the waters shall be first actually withdrawn or diverted, as aforesaid." Then the man affected shall have his right to petition. It means, I say, to deal with damages. Now, we have a term in the law, which is very familiar to us all, and I never saw a case where I thought it was more applicable, — damnum absque injuria, loss without an injury, — and that is exactly the condition of these complaints, as I shall proceed to show

you

I come to another of the questions to which I wish to call your attention. What are the rights of riparian proprietors in a stream? Why, it is agreed that they are only the rights in the natural stream. Now, what would be the discharge of the natural Sudbury river in the summer months without any reservoirs? Mr. Storrow very frankly and fairly tells you that every reservoir built aids the waterpower. Mr. Mills tells you that the more reservoirs the less valuable they are in summer time; but I don't think that is the general belief. At any rate, nobody acts upon it. Now, on Sudbury river there are thirteen mill-dams and reservoirs. The Essex Company have no right to those reservoirs. They have no right in those dams. They can let them go to decay, as in the case of the old machine-shop dam up on Stony brook, and the Essex Company cannot say "Why do ye so?" They can shut them up. They have only the right to the natural run of the stream - to let it flow in its natural course. Every proprietor below the city's dam has no other right than that, unless he takes the natural flow of the stream, as in Simpson's case. That will flow back, and he then has more rights. But the men below have no right to the reservoirs of Simpson's dam nor have they any right to the Talbot dam. Each dam goes to make up this volume of water, and all agree that the streams are growing better as water-power by the building of the reser-

Now, what I desire to impress upon you is, that the only right that a riparian proprietor has below is the natural right to the stream; the right to the natural flow of the stream,—all that is above that does not belong to him. That is stored up. He has paid nothing for it and he can claim nothing for it. That comes down to him by accident and he can claim nothing for it. And my brother Abbott will remember when the Cochituate water was taken, how fully that principle was applied to us. The Middlesex Company and Mr. Whipple's Company brought an action for very large damages, because they said that the Middlesex Canal (which was then in existence) had taken pretty much all the water of the Concord river in the summer time, and Boston was going to take the rest, and that there would not be enough left to grind our corn even up to Billerica. The suit went to trial, and we got our

notions as much inflated as my Essex friends have theirs as to what the damages were. There had been, since 1794, a dam at Cochituate, which had been flowed six feet, and that water had been drawn off and used as water-power. But the court ruled that we had no right to that water; that all the right we had was to the water which would flow out of that pond in the dry season, in a state of nature; and they produced gentlemen from that neighborhood, I know, to testify that it would all flow through an inch pipe in the winter time, and that there was an inch pipe that went up to somebody's house that soaked it all up in the dry season. The result of those suits is told in this book, the "History of the Water Works":—

"Two of these claim suits were tried; in one the jury could not agree on a verdict, and in the other, when the damage claimed was \$150,000, they awarded \$500. A proposition was then made for the discharge of all the claims, and they were finally settled and the suits discontinued by the payment of the sum of \$6,678.90 on the part of the city."

But the whole question there depended on what the right

was, and the right was only to the natural flow.

Then I say, if that is the right, we have not even got down to the natural flow of twenty cubic feet per second, one-fifth of the hundred cubic feet per second, in the summer time; because all these reservoirs above were supplying the water, so that, although we had the natural run between Sudbury and Concord, by taking down Concord's dam, yet we did not get the natural run above, because it was dammed above and there were reservoirs above. So that that twenty feet per second, one-fifth of the hundred feet which was measured by the commissioners in 1861, when they had no interest as between anybody below or above, but simply to determine the flow for the purpose of determining the amount of flowage, and which Mr. Storrow signed his name to, — that twenty feet was inflated, if you please, or enhanced by the reservoirs above. So that we are brought down to less than twenty feet a second, — when they admit they cannot measure within ninety feet a second by any means known to human power; yes, six mill-powers, one hundred and eighty feet per second — six mill-powers. If there are two hundred there, as they claim there are, they cannot measure within six millpowers. And we are reduced to two-thirds, or about onehalf a mill-power a second, a percentage inappreciable, and which they admit they can never find out and never know. True, they say if they had the water down there and knew it, they could sell it for a considerable sum. I agree. But it is exactly like the question of weighing hay on hay-scales,

— you do not expect your scales to turn within four or five pounds on a load of hay; you expect that much friction. When you come to weighing diamonds, you have a very different sort of scale, and measure very differently. But a matter like water is measured precisely as you would measure hay, and the half of one per cent. on a load of hay would be thought very small to be looked up by a farmer, would it not? Yet see what elaborate preparation has been made by great corporations to get a half of one per cent. on water! True, they can, by taking half of one per cent. on six mill-powers, and inflating it by an exaggeration of prices, render it very large in figures, theoretically. But they have at last to swear that they cannot measure it, nor measure anywhere near it.

Now, then, I will read a case which is familiar to you, from Welsby, Hurlstone and Gordon's Exchequer Reports, Vo. 6,—the case of Embrey vs. Owen, p. 370. Speaking of how much may be carried away without returning it, the Court says:—

"In America, as may be inferred from this extract, and as is stated in the judgment of the Court of Exchequer, in Wood vs. Waud, a very liberal use of the stream for the purposes of irrigation, and for carrying on manufactures, is permitted. So in France, where every one may use it "en bon père de famille, et pour son plus grand avantage." Code Civil, Art. 640, note a, by Pailliet (a). He may make trenches to conduct the water to irrigate his land, if he returns it with no other loss than that which irrigation caused. In the above-cited case of Wood vs. Waud, it was observed, that in England it is not clear that an user to that extent would be permitted; nor do we mean to lay down that it would in every case be deemed a lawful enjoyment of the water, if it was again returned into the river with no other diminution than that which was caused by the absorption and evaporation attendant on the irrigation of the lands of the adjoining proprietor. This must depend upon the circumstances of each case. On the one hand, it could not be permitted that the owner of a tract of many thousand acres of porous soil, abutting on one part of the stream, could be permitted to irrigate them continually by canals and drains, and so cause a serious diminution of the quantity of water, though there was no other loss to the natural stream than that arising from the necessary absorption and evaporation of the water employed for that purpose; on the other hand, one's common sense would be shocked by supposing that a riparian owner could not dip a watering-pot into the stream, in order to water his garden, or allow his family or his cattle to drink it. It is entirely a question of degree, and it is very difficult, indeed impossible, to define precisely the limits which separate the reasonable and permitted use of the stream from its wrongful application; but there is often no difficulty in deciding whether a particular case falls within the permitted limits or not; and in this we think, that as the irrigation took place, not continuously, but only at intermittent periods, when the river was full, and no damage was done thereby to the working of the mill, and the diminution of the water was not perceptible to the eye, it was such a reasonable use of the water as not to be prohibited by law. If so, it was no infringement of the plaintiff's right at all; it was only the exercise of an equal right which the defendant had to the usufruct of the stream.

"We are therefore of opinion that there has been no injury in fact or in law in this case, and consequently that the verdict for the

defendant ought not to be disturbed."

To reduce it to a question of practical use, it did not diminish the working of the mill perceptibly, nor was it perceptible to the eye, — they could not diminish it by its use for purposes of irrigation, so as to create a diminution which would be an infringement of the plaintiff's right, — a very different case from the case of Simpson, where there was an actual diminution of a large portion of the water.

The next case is that of Wood vs. Waud, in the third of Welsby, Hurlstone and Gordon's Exchequer Reports,

p. 780:—

"The next question is also one of considerable nicety. It is, whether the verdict should be entered for the plaintiffs on the pleas of not guilty, as to the third count, complaining of the abstraction of the water from the Bowling Sough, and the fourth, complaining of the abstraction and detention of the water from the Low Moor Sough.

"The defendants contend that the diminution of the water by five per cent., and the altering the flow of the water, are injuries

too trifling to be the subject of an action.

"In considering this question, it is to be assumed that the plaintiff's right is established to the use of the water. It is said that the true rule on this subject is laid down by Chancellor Kent, 3 Com., 439, 440, that streams are meant for the use of men, and that it would be unreasonable, and contrary to the universal consent of mankind, to debar each riparian proprietor from the application of the water to domestic, agricultural or manufacturing purposes, provided the use of it be made so as to work no material injury or annoyance to his neighbor, and though there will no doubt be, in the exercise of a proper use of water, some evaporation and decrease of it,—some variation in the weight and velocity of the current; but the maxim 'de minimis non curat lex' applies, and a right of action by the proprietor below would not necessarily flow from such use,—it would depend on the nature and extent of the injury, and the manner of using the water.

"In America, a very liberal use of the water, for the purpose of irrigation, and for carrying on manufactures, has been allowed. In France, also, the right of the riparian proprietor to the use of the water is not strictly construed. He may use it 'en bon père

de famille, à son plus grand avantage.' (Code Civil, Art. 640, note by Pailliet (a)). He may make trenches to conduct the water to irrigate his land, if he return it with no other loss than that which irrigation caused. In England, it is not very clear that such a user would be permitted, as arising out of the right to the use of the water jure natural; but, no doubt, if the stream were only used by the riparian proprietor and his family by drinking it, or for the supply for domestic purposes, no action would lie for this ordinary use of it; and it may be conceived, that if a field be covered with houses, the ordinary use by the inhabitants might sensibly diminish the stream, yet no action would, we apprehend, lie, any more than if the air was rendered less pure and healthy by the increase of inhabitants in the neighborhood, and by the smoke issuing from the chimneys of an increased number of houses. But, on the other hand, as the establishment of a manufacture rendering the air sensibly impure by emitting noxious gases would be actionable, so would it be if it rendered the water less pure by the admixture of noxious substances; and if a mode of enjoyment quite different from the ordinary one is adopted, by which the water is diverted into a reservoir, and there delayed for the purposes of a manufacture, an action seems to us to be maintainable; and so if by that mode of dealing with the water it is sensibly diminished in quantity.

"We think, therefore, that the issue on not guilty, so far as relates to both Bowling Sough and Low Moor Sough, should be found

for the plaintiffs."

"In the case of Evans vs. Merriweather, 3 Scammon's Illinois Reports, 492, it was held that each riparian proprietor is bound to make such a use of running water as to do as little injury to those below him as is consistent with a valuable benefit to himself; that where the stream is small, and does not furnish water more than sufficient to supply the natural wants of the different proprietors living on it, none of the proprietors can use the water for either irrigation or manufactures; that where all have a right to participate in a common benefit, and no one can have an exclusive enjoyment, no rule, from the very nature of the case, can be laid down as to how much each may use without infringing upon the rights of others. In such cases, it must be left to the jury to determine whether the party complained of has used, under all the circumstances, more than his just proportion.

"This was an action on the case for obstructing and diverting a water-course. A verdict was obtained in the lower court for the plaintiff, to which the defendant excepted. The case was heard on an agreed statement of facts, to wit: That Smith & Baker, in 1834, bought of T. Carlin six acres of land, through which a branch run, and erected a steam-mill thereon. They depended upon a well and the branch for water in running their engine. About one or two years afterwards, John Evans bought of T. Carlin six acres of land on the same branch, above and immediately adjoining the lot owned by Smith & Baker, and erected thereon a steam-mill, depending

upon a well and the branch for water in running his engine.

"Smith & Baker, after the erection of Evans' mill, in 1836 or 1837, sold the mill and appurtenances to Merriweather for about \$8,000. Evans' mill was supposed to be worth \$12,000. Ordinarily, there was an abundance of water for both mills; but, in the fall of 1837, there being a drought, the branch failed so far that it did not afford water sufficient to run the upper mill continually. Evans directed his hands not to stop or divert the water in the branch; but one of them employed about the mill did make a dam across the branch just below Evans' mill, and thereby diverted all the water in the branch into Evans' well. Evans was at home, half a mile from the mill, and was frequently about his mill, and evidence was introduced conducing to prove that he might have known that the water of the branch was diverted into his well. After the diversion of the water into Evans' well as aforesaid, the branch went dry below, and Merriweather's mill could not, and did not, run in consequence of it more than one day in a week, and was then supplied with water from his well. Merriweather then brought this suit in three or four weeks after the putting of the dam across the branch for the diversion of the water, and obtained a verdict for \$150. This suit, it is admitted, is the first between the parties litigating the right as to the use of the water. further agreed that the branch afforded usually sufficient water for the supply of both mills without materially affecting the size of the current, though the branch was not depended upon exclusively for that purpose. Furthermore, that at the time of the grievances complained of by the plaintiff below, the defendant had water hauled in part for the supply of his boilers. That the dam was made below the defendant's well, across the branch, which diverted as well the water hauled and poured out into the branch above the well, as the water of the branch into the defendant's well.

"After quoting the opinion of Mr. Justice Story, in Tyler vs. Wilkinson, 4 Mason, 400, the Court say, 'This doctrine is fully sustained by English and American cases. In the case of Arnold vs. Foot, 12 Wend., 330, it was held, where a defendant had diverted the water from a spring rising on his land to irrigate his meadow, 'that he had a right to use so much as is necessary for his family and his cattle, but he has no right to use it for irrigating his meadow, if thereby he deprive the plaintiff of the reasonable use

of the water in its natural channel."

"Each riparian proprietor is bound to make such a use of running water as to do as little injury to those below him as is consistent with a valuable benefit to himself. The use must be a reasonable one. Now, the question fairly arises, is that a reasonable use of running water by the upper proprietor, by which the fluid itself is entirely consumed? To answer this question satisfactorily, it is proper to consider the wants of man in regard to the element of water. These wants are either natural or artificial. Natural are such as are absolutely necessary to be supplied in order to his existence. Artificial, such only as by supplying them his comfort and prosperity are increased. To quench thirst, and for household purposes, water is absolutely indispensable. In civilized life, water for cattle is also necessary. These wants must be supplied, or both man and beast will perish.

"The supply of man's artificial wants is not essential to his existence; it is not indispensable; he could live if water was not employed in irrigating land, or propelling his machinery. In countries differently situated from ours, with a hot and arid climate, water doubtless is absolutely indispensable to the cultivation of the soil, and in them water for irrigation would be a natural want. Here it might increase the products of the soil, but it is by no means essential, and cannot therefore be considered a natural want of man. So of manufactures, they promote the prosperity and comfort of mankind, but cannot be considered absolutely necessary to his existence; nor need the machinery which he employs be set in motion by steam.

"From these premises would result this conclusion: that an individual owning a spring on his land, from which water flows in a current through his neighbor's land, would have the right to use the whole of it, if necessary to satisfy his natural wants. He may consume all the water for his domestic purposes, including water for his stock. If he desires to use it for irrigation or manufactures, and there be a lower proprietor to whom its use is essential to supply his natural wants, or for his stock, he must use the water so as to leave enough for such lower proprietor. Where the stream is small, and does not supply water more than sufficient to answer the natural wants of the different proprietors living on it, none of the proprietors can use the water for either irrigation or manufactures. So far, then, as natural wants are concerned, there is no difficulty in furnishing a rule by which riparian proprietors may use flowing water to supply such natural wants. Each proprietor in his turn may, if necessary, consume all the water for these purposes. But where the water is not wanted to supply natural wants, and there is not sufficient for each proprietor living on the stream to carry on his manufacturing purposes, how shall the water be divided? We have seen that without a contract or grant, neither has a right to use all the water; all have a right to participate in its benefits. Where all have a right to participate in a common benefit, and none can have an exclusive enjoyment, no rules, from the very nature of the case, can be laid down, as to how much each may use without infringing upon the rights of others. In such cases, the question must be left to the judgment of the jury, whether the party complained of has used, under all the circumstances, more than his just proportion."

Let me say here, that the Essex Company and the people at Lawrence had a great deal better have the people of Boston kept clean, well washed and healthy, so that they can wear a great deal of cotton cloth and woollen cloth, than have them die off for want of water, and the company get their pay for the water. The balance of convenience will be wholly on that side.

"In Wadsworth vs. Tillotson, 15 Conn., 366, the Supreme Court of Errors held, that where the Court, on the trial of an action for

the diversion of a water-course, instructed the jury, that if the defendant had taken the water in question from a spring on his land, by an aqueduct, to his house and barn, and had there suffered it to flow constantly, at all seasons, in larger quantities than he needed, and used for domestic and culinary purposes, and for watering his cattle, and none of it returned into its natural channel, and what was not so needed or used ran on to the land of the defendant, or was lost, he had infringed the rights of the plaintiff, the riparian proprietor below, for which the plaintiff was entitled to recovery, this was a misdirection, as it should have been submitted to the jury to decide, upon the evidence, whether the defendant had used the water in a proper and reasonable manner.

"The Court say: Every proprietor of land, through which a natural water-course runs, has an equal right to the use of the water for every useful purpose to which it can be applied, as it is wont to run, without diminution or alteration. This right is not an easement or appurtenance; but is irreparably annexed to the soil, and is parcel of the land itself. Consequently, no proprietor has the right to use the water to the prejudice of any other proprietor above or below him, unless he has acquired a right to use the water in some peculiar manner, and differently from what he would be entitled to do, as mere riparian proprietor; which he may do, by an actual grant or license from the proprietor affected by his operations, or an uninterrupted enjoyment for such a length of time as would afford a conclusive presumption of a grant which, in this State, is fifteen years. But, whatever may be the right of any proprietor, or however acquired, it must be exercised in a reasonable manner, and so as not unnecessarily to injure the right of others. (Twiss vs. Baldwin, 9 Conn. Rep., 291.)

"Each of the parties, in this case, was entitled to those rights in the water flowing from the spring in question, which are annexed to land through which runs a natural water-course; it being conceded, on the trial, that no such use had been made of said spring, or the water flowing therefrom, as to vary the natural riparian rights of the parties thereto. The defendant, therefore, as proprietor of the land on which the spring was, had the undoubted right to use the water of it, for the purposes for which she used it, namely, for her domestic and culinary purposes, and watering her cattle. This has not been questioned. The question then is, whether she exercised this right in an improper manner,

or so as to violate the rights of the plaintiff.

"It is claimed that there has been an improper diversion or waste of the water, by reason of the surplus not being returned to the natural channel of the stream. Now, it is obvious that there is scarcely any mode whatever, whether artificial or not, by which water can be beneficially used which would not be necessarily attended with some degree of loss. It is not practicable for every particle of it which is not used or consumed to be returned to the original stream. It does not, however, necessarily follow that in such cases there has been an improper use of one's own rights, or an infringement of the rights of others. The principles on this subject, as they are generally, and with substantial accuracy stated

in the books, that each proprietor through whose land the stream runs is entitled to its use, as it is wont to run (ut currere solebat) without diminution or alteration; and, that the water cannot be diverted, in whole or part, but must be returned, after it is used, to its ordinary channel, are not to be understood so literally as to prevent that small or unessential or insensible diminution, variation or loss of the water which is necessarily consequent upon the beneficial and proper enjoyment of it; for such a strictness of construction would be wholly incompatible with the nature of the element and most of the important purposes for which it was created; and, indeed, in most cases, would prevent its beneficial enjoyment at all. As remarked by Chancellor Kent, 'There will, no doubt, inevitably be, in the exercise of the perfect right to the use of the water, some evaporation and decrease of it, and some variations in the weight and velocity of the current. But de minimis non curat lex, and a right of action by the proprietor below would not necessarily flow from such consequences, but would depend upon the nature and extent of the complaint or injury, and the manner of using the water. All that the law requires of the party by or over whose land a stream passes, is, that he should use the water in a reasonable manner, and so as not to destroy or render useless, or materially diminish or affect the application of the water by the proprietors below on the stream.' 3 Kent, 439. In Palmer v. Milligan, 3 Caines, 312, Spencer, J., said, 'The act of erecting a dam, by the defendants, was a lawful act, and, though in its consequences slightly injurious to the plaintiffs, they are remediless. The erection of dams on all rivers is injurious, in some degree, to those who have mills on the same stream below, in withholding the water, and by a greater degree of evaporation in consequence of an increased surface; yet such injuries, I believe, were never thought to afford a ground of action.' And in Platt vs. Johnson, 15 Johns. Rep. 218, Judge Thompson says: 'Although some conflict may be produced in the use and enjoyment of such rights, it cannot be considered, in judgment of law, an infringement of the right. If it becomes less useful to one, in consequence of the enjoyment by another, it is by accident, and because it is dependent on the exercise by the equal rights of others.'

"The loss of water, which is merely incidental to the proper use and enjoyment of it, cannot, therefore, be considered an injurious diversion of the stream. The increased evaporation, produced by the exposure of a larger surface, by means of the erection of a dam, would be, in a loose sense of the term, a diversion of the water; but it is not a diversion, in the technical sense in which it is used, when it is intended to denote that peculiar species of injury. The constant escape of the water from the defendant's penstocks was indeed literally a diversion of a portion of the stream; but the occurrence of the loss by this means might, notwithstanding, be merely incidental to the use of the water, and the particular purposes for which it was used, in this instance, by the defendant, and should be governed by no other rule than what would apply to an incidental escape by any other means. If, therefore, the defendant has not made an unreasonable use of the water, if she has used it with a prudent and cautious regard to the rights of the plaintiff, she is not liable, although in so doing there may have been some loss of the water. If, on the other hand, such use was unreasonable, and, from a want of such prudence and caution, the water was unnecessarily wasted, the defendant is answerable for the consequences. . . .

"There being, therefore, nothing wrong in using the water by means of an artificial aqueduct, and the defendant not being necessarily liable, because a portion of the water not used has not returned to its ordinary channel, the question was, whether she used the water in a proper and reasonable manner. We think, therefore, notwithstanding the facts admitted by the defendant, she should have had the benefit of having those which she claimed to have proved submitted to the jury, with a view of ascertaining whether she was obnoxious to the charge of not having done so."

In other words, it all comes back to this: in this great element, as it is called, — great necessity for the existence of mankind, — will a small diminution on a navigable river, made by taking one of its sources for the supply of man, be such an injury that the party having the right of waterpower below has a right to complain, and say that he is to be compensated in damages?

[Recess till $1\frac{1}{2}$ o'clock P. M.]

AFTERNOON SESSION.

CONTINUATION OF GEN. BUTLER'S ARGUMENT.

Mr. Chairman and Gentlemen: - I now proceed to the question, What should be the amount of damages? I have discussed thus far the proposition that no damages should be Although the matter in the aggregate, theoretically, looks large, yet taken in conjunction with the subject-matter which we were discussing, it is like the weighing of a load of hay by a scale that only turns with four pounds, and which, after many millions of pounds had been weighed, would show a large diminution; but in the practical affairs of life, it is only the immaterial things which cannot be measured. But assuming now that some twenty cubic feet (which I think is the largest amount which is proved here) per second is, in the dry season, diverted from their dam, of course in any other season, when they have all that they can use, there is no damage, and therefore there are no damages to be allowed; and it does not make any difference upon the question as to the use of the water, whether it is used by riparian proprietors or by others, because the cases which I have already read to you carefully distinguish between a public right and a common right. That is, the use of water for domestic purposes is a common right, common to the whole people; therefore, this being taken by the Commonwealth for the common use of the people, certainly, where no sensible diminution is proved, — I mean sensible, not a theory of mathematics, but sensible to the actual diminution of the value of the property, — there can be no claim, any more than there can be a claim on a small stream that anybody shall be excluded from taking water himself or watering his animals or washing his clothes from its banks. And it makes no difference where the water is carried. In that regard I will give you one or two citations.

I cite the Earl of Norbury vs. Kitchin, 7th Law Times, page 685, decided January 31st, 1863, in England:—

"We are of opinion," says Pollock, C. B., "that this rule ought to be discharged. My brother Channell, who is not now present, was of the same opinion. The action was brought for withdrawing water from Lord Norbury's service, and the verdict was found for the defendant, in respect of one question, which is the only important question, namely, whether the defendant had taken an unreasonable quantity under all the circumstances. My brother Martin laid down at the trial, that no taking of the water for purposes other than those of utility could be justified. The jury therefore, in accordance with my brother Martin's direction, found that the taking the water for those other purposes was not justifiable, and therefore found a verdict for the plaintiff, but gave a farthing damages in respect of those matters which were complained of. . . . As my brother Martin, in the course of the argument, I think very properly, pointed out to Mr. Bovill, to what end complain that it has been improperly laid down that a riparian proprietor may take the whole in a case where the flow of water was upwards of 300,000 gallons, and it was quite clear that the defendant had never taken more than from 6,000 to 9,000 gallons? Whatever, therefore, may be the law in a case that would, I should think, very rarely occur, and which in my professional experience I never met with, where the riparian proprietors were contending about a few pints of water flowing down, and who should have the smaller quantity, yet in a case where the quantity is so abundant as in the present case, to what end complain that an extreme case was alluded to and an opinion adopted of a learned judge in a matter, as far as this case is concerned, I think, purely hypothetical? For whether or not a riparian proprietor may take the whole, to the utter disregard of the wants of those to whom the water is to flow, is a matter wholly immaterial to the present question. . . . The questions whether the defendant had a right to use the machinery, whether he had a right to apply the water to wash gas pipes, or to purify the gas itself, or to use it for any other extraordinary purposes of domestic life, not known to our ancestors, do not at all arise. None of these questions were so specifically presented as to be in any degree the foundations for a just application for a new trial." Then Wilde, B., says, "I have

looked, with great care, at the two reports that have been handed to me, — the one a printed report of nisi prius cases, by Messrs. Foster & Finalson; and, in that report, I find that the learned judge told the jury this: 'That the defendant had no right to take more by means of his wheels and water-works than he would have a right to take otherwise; but he had a right to take as much as he wanted, so that it was not an unreasonable quantity, with reference to his neighbor's rights.' Then, again, in the shorthand writer's notes, I find the expressions repeated over and over again, to this effect: 'This right depends upon the reasonable use of the water; according to the law laid down by Lord Kingsdown, it does appear to me, that the question for you to consider is, whether the quantity of water that Mr. Kitchin abstracted is a reasonable quan-According to that you have the evidence of Mr. Easton. And then the learned judge reads the evidence, and then he remarks upon what was said about pumping out, and then he again repeats, 'he is not entitled to take more by means of pumps than otherwise.' Then he also remarks this: 'That it might not be reasonable to take a certain quantity in respect to a small stream; ' he says, 'It is impossible for the human mind not to compare quantities; when you are talking of a reasonable use, you must consider the size of the stream. Therefore upon that first question you will say whether or not the use made of this water which the defendant is entitled to use, not as of favor, but as of right, is more than the reasonable use for the purposes of his house, and those other matters.' Then, finally, he disposes of the other question about damming-up, and when the question goes to the jury, it goes in this way, 'The substantial question is, aye or no, is the quantity of water that the defendant has taken from this place, a reasonable quantity, with a view to all the circumstances of the case? That is the real and substantial point.".

And Martin, B., says:—

"Neither Mr. Lush nor Mr. Honyman relied upon that, nor Mr. Bovill to any great extent. Here were two persons who were riparian proprietors in this stream, which flowed at the rate of 330,000 gallons a day; and at the outside, as was proved by the plaintiff's witnesses, the defendant took from it 6,000 to 9,000 gallons a day. The real question was whether a man who had left to him 321,000 gallons a day, at the outside, could complain of his neighbor taking 9,000 gallons or 10,000 gallons a day; that was the real question. My brother Wilde has read the terms in which I left the question to the jury; and I can only say that, if I had the same question to leave to the jury again, I would leave it in the same way. I believe it is quite correct, and that in fact there was no other mode of dealing with it. I agree, with the rest of the court, that our judgment must be to discharge the rule for a new trial" . . . "It appeared that the water-course in question was a natural stream, which rose from a farm of the defendant's called Piper's farm, adjoining the plaintiff's park. From the defendant's farm it flowed down into the plaintiff's park,

through a pond on the farm, just outside the park, called Cutmill pond. Here, in 1858, the defendant had erected water-wheels and machinery, the effect of which was to pump up the water in the pond about 150 feet above its level, and then direct it by a pipe to a supply-tank, and thence to an artificial pond or lake on another property of the defendant's called the Dunsdale estate, also adjoining, and formerly forming one estate, with Valence or Hill park, belonging to plaintiff. From Cutmill pond the natural stream ran through the plaintiff's park to and through several ornamental ponds or lakes therein, and to the plaintiff's mansions; and the effect of the defendant's work had been, as was alleged, to lessen the flow of water thereto. Between the park and the Dunsdale property there is a ridge of land about 160 feet above the level of Cutmill pond, so that but for the artificial works the water could not be brought to the Dunsdale estate. wheel was between Cutmill pond and the park, just inside the defendant's farm, so as to intercept the stream as it ran from the pond into the park. The wheel was a common water-wheel constructed with buckets, into which the water fell; and the water ran from the pond upon it. The wheel worked two pumps, which raised the water, and it was then taken through pipes to the reservoir or supply tank on the defendant's property. The tank was 153 feet above the level of the pond, and it was capable of containing 13,000 gallons. From that reservoir the water was taken in pipes down to the defendant's house. There was also a wastepipe connected with the water-works, by which the water, which was pumped up in excess beyond the capacity of the reservoir to contain it, was carried off and discharged into the stream below the plaintiff's premises, and out of his reach.

"The cause was tried before Martin, B., and a special jury, at the Maidstone summer assizes, in July, 1862, when it appeared by the plaintiff's evidence that the supply of the water to the plaintiff's park had been greatly lessened and deteriorated; sometimes the supply had been wholly stopped by the action of the wheel, and at times also it had flowed down in a foul and dirty condition. The stream runs into the river Darent, and the water-bailiff employed by the mill-owners on that river was called to prove a diminution in the quantity of the water poured into the river from the stream since the works in question. The wheel raised and diverted about 10 gallons a minute, or 600 gallons an hour; but the water-bailiff had not reported it to the mill-owners

since January, 1859.

"On behalf of the defendant it was contended that he had a right to take away a reasonable portion of the water, so that he did not sensibly or materially diminish the quantity of water available for the plaintiff. He denied that he had done so permanently, although in the course of the erection of the works, etc., or in cleaning the pond, etc., there may have been a temporary obstruction of the flow of water. The defendant's evidence showed that the works took up, on an average, from 6,000 to 9,000 gallons a day, or one-fortieth part of the whole bulk of water which ran into Cutmill pond. The highest quantity of the entire

flow was 332,000 gallons a day, and 9,000 gallons a day might possibly be taken up by the pumps, i. e., about one-thirty-seventh part of the whole, and that this was a proportion of the water which, although appreciable, was not really material."

"Although appreciable was not really material." That was used upon another estate; so that this right to water is a common right. If a man can get it without trespass, he has a right to use it to a reasonable extent. That reasonable extent is always, even when he uses it to inappreciable limits, to the use of the water below that. But assuming that this party had the right to remuneration, let us see what it should be. And that requires some little consideration. The City of Boston ought to pay what it is worth, really worth, and no more. If they pay more, you do the tax-payers of the City of Boston a great wrong: if they pay less, you do a wrong of substantially the same kind to the complainants. Now, I believe that the natural flow of Sudbury river, where we take the water, if left to itself, would not give more than 20 cubic feet per second a day in the dry season, when alone it would be valuable. They don't claim that it gives more than 45, reckoning the wastage, as Mr. Mills testified. Let us try it from the higher level, 45. That is a millpower and a half. They have put in a great deal of testimony to show how very much they expect to make out of their lands by the use of water-power, all of which is true, and all of which I hope they will make; but they have to admit that they would not alter anything in the price of lands if they had not this power. They would think it would be more valuable if they had so much more water-power, but they say they should not alter the sale of lands or the price of lands. I think all those considerations are too remote, but there is another class of considerations to which I wish to bring your very careful attention, because this is Suppose it is a mill-power and a half. That, at their price, would be \$30,000; \$20,000 the mill-power, and \$1,200 a year they let it for, which would be 6 per cent. When are they going to suffer that damage? Why, they admit they are not the sufferers until they have exhausted their mill-power. When will that be done? They have got 200, more or less, — 186 they admit, the smallest sum, — and they expect to get more, and Mr. Storrow thinks they have got more. Now, they began their works in 1846, began selling, and received large payments then in proportion to what was sold them. Of course, they wanted their money to put up their works, and now they have got their works up they let at about the same sum, \$1,200 a year. Now, they

have been thirty years selling 122 mill-powers, building up a great city, and of course the earlier sales were very much the most rapid. You will find in the table which I had put in this morning an answer to very much of this talk of the great addition, by selling powers, to the value of the land. You will find they made no difference in price whether they sold one twelfth of a mill-power, or whether they sold a whole mill-power, or six mill-powers, or eight mill-powers, and forty mill-powers would bring a large population, while one twelfth would bring a very small one, and undoubtedly the proprietor would live in the same house and board himself; so that cannot be taken into consideration; and the last seven years, since 1869, taking the fair average of the years,

they have sold about one mill-power a year.

They have therefore got 66 to sell; and at this average it will take them 66 years to sell out, to know, to a certain extent, whether they had the Sudbury river empty or not. Will it not, at that rate? At the rate they have gone on, they have sold less than six a year, all told, to everybody. Now you see the wisdom of the statute in fixing that you shall not begin to pay until you take the water, and I will show you why. Suppose you paid them what the water is worth to-day, and before they are affected by it. If they do not want to sell any faster than they have for the last seven years, it would be 66 years before they would be injured. You pay them \$30,000 to-day, and what would be their position? Put that at 6 per cent., and it would double once in ten years, and in 66 years it would get to be about \$640,000; that is, if you give them \$30,000 to-day for this millpower and a half, which they will want to use 66 years hence, that money capitalized would be greater than their capital stock to-day before they can be injured, and it will take 30 years to go on and sell out at about the same rate that they have been selling out, and that doubled would quadruple the amount. Now this is not fanciful by any manner of means. If you will look into the English books of engineers making estimates, you will find they always take this into account in what they call "capitalization of the property," capitalization of the sum; and this is practically inappreciable, is it not? They will not be harmed until they come to the time when this amount of water-power makes a difference with them; until their water-power gets so low that they can use so much more and need so much more, and they can tell that they have lost it. They cannot tell now that they have lost They admit that they cannot tell whether they have lost nearly four times as much, certainly nearly three times as

much; they cannot tell to-day. Now, they will not be harmed until they use up this water-power, until they want their last mill-power. As long as this turns and runs over the dam to waste, it is of no more use than the spring flood, not a bit. Now, if you give them a sum of money equal to \$30,000, doubling once in ten years, and if it were 30 years, take it at the same rate, it would get to be \$180,000, at 6 per cent., which is the basis upon which they made all their calculations; if it goes to 66 years, which is the rate of selling mill-powers as that table shows for the last seven years, it would double six times and get up to something like \$640,000,—I mean to say, more or less. Therefore, if you should give them a sum to-day of \$1,000, that, put at interest at 6 per cent., would be worth more than the whole power would be worth to-day; and you are to pay them what they are damnified; and they all admit, everybody admits, that until they have sold their water (for they simply sell and have the water for sale), until they have sold their water down 66 mill-powers more, at the lowest calculation, they will not miss this water. How are they damaged? How are they damnified? Now, what sum are you going to give them? Do you propose to take a sum out of the City of Boston, before the City of Boston makes one hair white or black, or takes one drop of water which they can use from them, that will amount to more than their capital stock? I think not. You will find it in the various works of the leading engineers, where they take this question of capitalization into account, as it ought to be taken into account. I put it to you, just and sensible and fair men, sitting here to deal between party and party, how much will you give to-day for water technically taken which would simply run over the dam? And you might just as well give them damages for that which runs in the spring, when they cannot use it, as for this which runs in the summer, when they cannot use it, and which is flowing over the dam as we saw it when we were there. I think this is a matter which is worthy of your careful and serious consideration.

There is another question which I want to put to you, although we had a little fencing about it, and my friend, Mr. Storrow, when he was on the stand, testified in relation to it, being the expense of \$200,000. Gentlemen, they have got a reservoir up at Winnipiseogee which affords them 400 cubic feet per day, and I say we don't take but 20 in the dry season. They could build another reservoir somewhere else, and they would have more than enough to pay for Winnipiseogee before this loss would harm them, if you should give them \$5,000 in the reasonable and ordinary sales that they

make of their water, and the average sales they have made for the last seven years. Now, all I ask is justice between man and man. I am not going to detain you to go into these very elaborate tables, or the very elaborate calculations that have been made about the value of these sales of land. I don't think they belong to this case. I think they are too remote. I think this is a class of considerations which does not enter into this question. This is a practical question, because, don't you see, if you charge us, or we should pay, you charge us for all their expected profits, for the loss of a mill-power and a half, and the expected profits of all their land, when they can put up a steam-engine for a thousand dollars, or \$1,500, which would give them a millpower and a half, and they would have all the power, which this mill-power and a half would give them, to draw round a population to enable them to sell their land? Why, that will not do. Therefore, I say, all that is too remote; but the simple practical question, brought down to its lowest terms, is, what expenditure would make them whole when they feel the loss, and give them that. Of course, I don't mean to say that you must not include a sum of interest which would be appropriate; but interest would not be a fair compensation. But I say again, that this is not going to affect them for a long series of years, and whatever sum they may be allowed, put at interest, will very much more than compensate them. don't know that I can aid you in any other matter. We have not calculated the water-shed of the Merrimack river, and for the reason that we did not think there were any maps of such reliability that we could calculate it. We have calculated with care the water-shed of Sudbury river, and we do not find any occasion to dispute the calculation of that, because the maps are so perfect that we find we cannot dispute that amount. One caution, perhaps. I am not carrying this argument to a place where there is a sensible or reasonable diminution of water. I am confining it wholly to the Essex Company. The views which I have presented to you apply to many of the cases — to all below Mr. Simpson's dam; and I have been a little careful in speaking thus at large in this case, because I do not propose in future arguments to recur to them again, but to let each case stand upon its own peculiar merits, so far as argument is concerned, and in settling the particulars respecting which we differ, and the facts.

I have only one more, and a very pleasant duty to perform, and that is to thank you for the careful and quiet and patient attention with which you have listened to me, and to express my obligations for the hearing which I have received.

CLOSING ARGUMENT OF ELIAS MERWIN, Esq., FOR THE PETITIONERS.

Mr. Chairman and Gentlemen:—Before proceeding to discuss what I conceive to be the substantial question upon which you are to pass, I will briefly consider some preliminary objections which have been submitted in behalf of the respondents to the allowance of this petition for the assessment of any damages in behalf of the Essex Company. The first objection taken is, that there is no evidence that any demand was made upon the City of Boston for the payment of damages prior to the institution of this petition. My answer to that is that the act under which this petition is brought requires no such demand. The only provision having any possible relation to that subject is in the sixth section of the original act, and is as follows:—

"And if the owner of any land, water, or water-rights which shall be taken as aforesaid, or other person who shall sustain damages aforesaid, shall not agree upon the damages to be paid therefor, he may apply, by petition, for the assessment of his damages," etc.

Not to detain the board with any general argument on that matter, it is enough to say that this precise question arose in the case of Burt vs. Brigham, 117 Mass. R. 307, in relation to the land taken for the United States post-office building, and in which the Supreme Court have held that this provision, or a provision similar in its terms to this, does not require any proof of any preliminary action between the parties upon the matter; but the very fact that the petition is instituted is sufficient evidence that the parties have not agreed upon the damages which the one shall pay and the other shall receive. The petition is of itself the best evidence that the parties have not "agreed."

Commissioner Russell. On the ground that it is always

competent for a petitioner not to agree?

Mr. Merwin. Yes, sir. The case is perfectly familiar to the chairman, and therefore I do not dwell upon it.

The next objection is that there is no proof that this water

has actually been diverted or withdrawn.

In reference to the first objection, I am reminded to call

your attention further to the fact and consideration that the petition alleges that the city have not agreed upon the damages to be paid therefor, and have not offered to pay to the petitioner any sum whatever for such damages; and that allegation is not denied nor in any way met by the answer.

I therefore pass to the second objection, which is, that there is no proof that the water has actually been withdrawn or virtually diverted by the city under the authority of this act, and that such preliminary withdrawal or diversion is necessary before any application for damages can be made. Upon that point I desire only to refer to the evidence of Mr. Frost; and for the sake of accuracy I will read from the report of his testimony one or two questions and answers:

"Q. Can you tell me whether the City of Boston diverted the water of the Sudbury river, and stopped it from their dam and from flowing down at any time of the year, — the year of 1875?

"A. Yes, sir; they did.

"Q. When?

"A. During part of the months of July and August.

"Q. Did you have any occasion to notice it at that time, and did you notice it particularly?

"A. Yes, sir.

"Q. Have they done it since then? "A. Yes, sir."

The board will recollect that there was no cross-examination of the witness upon this point.

General Butler. Oh, yes, there was. I asked him if

it flowed down the old channel of 1872.

Mr. Merwin. Very well. It is immaterial through what channel it passed after it was diverted by the city. It was diverted by their dam, and I take it as a piece of the history of this case that the attention of the commissioners was drawn by the city, through their counsel, to the dam and the position of it; and we have the fact that by that dam the water was diverted, certainly for portions of two months in the year 1875, so that we are willing to proceed upon the testimony which is before you upon that point without further discussion of it.

It is next said that certain rights existed in the Middlesex canal to the waters of the Concord river, and that, if I understood the argument, that right reverted to the Commonwealth, and has passed to the City of Boston, and that so far as any right to the water of the Merrimack river has been acquired in that way by the City of Boston, these petitioners have no claim for any damages which they may have suffered

by the appropriation by the City of Boston of the water of the Sudbury to that extent.

General Butler. Not quite that the city had acquired

it, but that you had lost it. You never had it.

Mr. Merwin. Well, taking the proposition in that form, whether acquired by the city or not, that the Essex Company have no right to it. Now, let us see. It appears that a charter was granted to the Middlesex Canal, including a right to appropriate the water of the Concord river, to a certain extent, for the purposes of navigation; that in the year 1859 a decree of the Supreme Judicial Court of this Commonwealth, in a suit instituted by the authority and direction of the Legislature against this corporation, annulled the charter, and annulled any rights which the Middlesex Canal had held under that charter; and that an act of the Legislature, to which you were referred this morning by the learned counsel for the respondents, was subsequently passed (St. 1860, ch. 203), undertaking to confirm the decree of the Supreme Court in that respect; and by the terms of that act all rights of this corporation were annulled, — not transferred to the Commonwealth or to any other body or person, — but were annulled.

General Butler. "Seized to the Commonwealth."

Mr. Merwin. "Seized and annulled;" and therefore they ceased to exist, precisely as if no such charter had ever existed. There was no transfer or conveyance in legal effect, by that decree or by the act of the Legislature, from the Middlesex Canal to any other person or body, but an annihilation of all the rights and franchises and titles which had previously existed in the Middlesex Canal, by virtue of their charter, and any acts lawfully done in pursuance of it. If that is so, then, of course, the rights of all parties, so far as they have any, to the water of the Concord river are to be determined precisely as if the Middlesex Canal never had had an existence. That is our first answer to the proposition of the learned gentleman.

The second is, that if any right remained to the use of this water for the purposes of navigation it has been lost by adverse use by the Essex Company, in common with the other riparian proprietors of this stream, for a period of more than twenty years. The decision referred to this morning, of 7th Gray, is not in conflict with that proposition, which depends upon the plain fact, that there has been this adverse use for a period of more than twenty years, beginning with the time when the Middlesex Canal Company ceased to use the canal as a canal, namely, in 1851. The case in 7th Gray merely determined that at that time (the decision was made in 1855)

the mere non-user by this corporation of its franchises or corporate rights did not amount at that time to a forfeiture or an abandonment of their corporate rights, but it does not determine that if the Essex Company have, adversely to the clams of this corporation, used all the water of this stream for twenty years, the Middlesex Canal Company has not now lost — in 1875 or 1876 — whatever title it may have originally possessed to the waters of this stream for the purposes

of navigation, by adverse use.

But, in the third place, we submit that if there is any title existing anywhere — or (as was once said in reference to an unpublished decision of our Supreme Court) "lurking" anywhere around in the Commonwealth, — a title in the Commonwealth itself, or in anybody else, to use the waters of this river for the purposes of navigation in that canal, we submit, as a matter of fact, that that right, in the estimation of this board, will not diminish to the extent of one dollar the value of the water power of the Essex Company at Lawrence; because, in view of the condition of things, of the canal itself, of what has taken place for the last twenty or thirty years — the competition which the canal would suffer by the railroad which runs along its line — it is not within the bounds of human probability that anybody, not even the Commonwealth, would deem it to its financial advantage to operate that canal as a means of navigation, or turn the waters of the Merrimack into it for that purpose; and, therefore, that it is not a consideration to be weighed as among the probabilities that such an outstanding right, if such right did exist, would be likely to be exercised so as to diminish practically the value of any mill-power upon that stream. And you will judge, gentlemen, if you have any doubt upon these considerations, as to whether such a title is extant, or whether it is extinct, how far that fact affects, if at all, the value of the water-power of the Essex Company; and I imagine you will find it to be of that inappreciable and unmeasurable value and extent of which my learned friend on the other side has had so much to say.

Much of the learned counsel's argument, and the cases which he has cited in support of it, have had reference to the simple proposition that the riparian proprietor upon the borders of a stream has, to a certain extent, a right to the use of the waters of that stream, and if the use which he thus makes of it is within reasonable limits, for domestic and agricultural and other well-defined and known purposes, a mill-owner below, on the same stream, or any other person having a right to the natural flow of the water on the same

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stream below him, cannot object; and such use by the riparian proprietor furnishes no legal ground of action if he does not go beyond this reasonable and ordinary and accustomed use of the water of the stream. But, gentlemen, we are not considering any such case as that here. I have yet to learn that the City of Boston dwells on the banks of the Sudbury, and that they propose to use the water of that stream in this natural and accustomed manner, returning it to its natural channel after they have used it in this reasonable and ordinary method. My learned friend's argument, if he will allow me to criticise it so, is an entire fallacy. He presents to your consideration, and cites authorities to maintain, a familiar principle of law which has no application whatever to the facts of this case.

The question here is not between the Essex Company and the riparian proprietor upon the banks of the Sudbury, or upon the banks of the Merrimack. We are not saving to Mr. A or Mr. B, upon the banks of either of those rivers, "You shall not water your cattle from those streams, or apply so much of the water of this stream as is necessary for your domestic or ordinary agricultural purposes." On the contrary, the City of Boston has taken, not any per cent., but the whole of this upper Sudbury. They appropriate the whole of it. Not by virtue of any natural right, not by virtue of any artificial right, or any right growing out of the usage of society as dwellers upon the banks of that stream; and but for the act of the Legislature, under which they assume to proceed, their diversion of the water would be a trespass. They undertake to divert the whole, the hundred per cent. of the waters of the stream above that dam for their own purposes. And they do this, sir, not merely for domestic purposes, not merely for the purpose of affording water to drink to the inhabitants of the City of Boston, but under the terms of the act they propose to divert it for any and for all purposes to which they may choose to apply it, or sell it to others to be applied; for creating mill-power, and running machinery if they find it to their profit to use it in that way, or for supplying the inhabitants of the city with water to drink, or to wash their clothes with, so that they may present a respectable appearance to my learned friend on the other side. And as an illustration of this I know nothing better than the case cited by my friend this morning. I mean the case against the members of the Water Board by the Wamesit Company, where the Court held that the diversion by these gentlemen of this water, unless sanctioned by the express terms of this act, although

it was to be used by the City of Boston, was an uulawful act, and therefore clearly was not such an act as came within the exercise of any right of a riparian proprietor or otherwise. And this act under which alone they

take requires them to pay damages for all they take.

We thus come, I think, gentlemen, to the consideration of the real issue in this case. By virtue of the act, to which you have been frequently referred, the City of Boston was authorized to take and appropriate the waters of this Sudbury river, paying to all persons or parties who were injured in any respect, in their legal rights or property, by this taking, such damages as these commissioners or the commissioner provided for by the act should assess; those damages being, of course, that amount which the parties respectively, in the consideration of the tribunal to whom that question was referred, had actually suffered. And the question here is, What damages have the Essex Company sustained, or will they sustain, by virtue of the diversion of this water by the City of Boston? As a preliminary consideration, I desire to call your attention to the fact, which is a very familiar one, of course, to this board, that the compensation which is to be awarded to the Essex Company is to be awarded now for all time. Under the decisions of the Supreme Court of this State, under acts similar to this, it has been held that in legal contemplation the injury to the party is done when the taking is effected by the city or the corporation, or the party who, under the act, is authorized to take the property or do the act which results in the damage; and that the tribunal to whom the assessment of damages is referred is to consider and decide, once for all, not merely what the party has suffered up to the time of the filing of the petition or the hearing of the case, but what he will suffer, during all time, from the act which is the ground of the claim of damage; and therefore, sir, the amount which you are to assess in this case is such as will indemnify the Essex Company from this time forth forevermore for the act of the City of Boston in diverting the waters of the Sudbury river at the point where they have diverted them.

The measure of our damages is, not what we have already appreciably suffered, but whatever we may, under any possible contingency, hereafter suffer by the diversion of the Sudbury river. And that indemnity must be given now,—once for all. If any injustice is now done, by reason of insufficient compensation, it can never be redressed hereafter. (Ipswich Mills vs. County Commissioners, 108

Mass., 364.)

It is wholly immaterial, in our view of this case, whether

the actual damage up to the present time has been appreciable or not, if we satisfy you that, by the diversion of this water, our water-power is, or will be, so materially reduced that we shall lose financially by reason of that taking or diversion. And now that brings me to the real question in this case, which is, To what extent does the diversion of this water diminish, or will it diminish, the water-power of the Essex Company? I am relieved, gentlemen, from the necessity of going into much detail in discussing that question, by the fact that the testimony which we have submitted to you, for the purpose of showing what amount of water passes the dam of the Essex Company at Lawrence, and what amount of mill-power is furnished by it, is not controverted seriously by the respondents in this case. We have submitted to you, by the testimony of Mr. Storrow and Mr. Mills, certain tables and measurements, and certain conclusions derived from them, which fix the quantity of the water and the amount of the mill-power at those points, and I have no doubt it will be a great satisfaction to you, as it certainly is a great relief to the petitioners, that those conclusions and statements, and that that evidence in detail, may be assumed to be as absolutely correct and reliable as human skill, and fidelity, and truth applied to such topics, can make it. The City of Boston has been aided, and is aided to-day, by a skilful and competent engineer; it has all the facilities which can possibly exist in the nature of things for showing any error or mistake in the calculations which have been submitted to you on the part of the petitioners, if such mistakes exist, or any statement or omission which affects the conclusions stated by those witnesses; and we have, directly and indirectly, the most significant and conclusive admission, that at least the basis upon which we proceed, and upon which we ask you to proceed, in the assessment of these damages, is practically, and I might almost say, absolutely and mathematically, correct. So that, gentlemen, your only anxiety and scrutiny will be to see that no false conclusion is drawn from premises which we may all assume to be absolutely correct, and to be all that bear materially upon these questions. It is, then, conceded that the Merrimack, previous to the diversion of the Sudbury by the City of Boston, furnished a minimum at Lawrence of 2,400 cubic feet a second during twenty-four hours, and that is equivalent to 145 mill-powers for sixteen hours, or 165 mill-powers for fourteen hours, or 185 mill-powers for twelve hours. How much of that was supplied by the Sudbury, which has been diverted, is the next question. Well, gentlemen, upon that question there can be no doubt.

It has been stated to you by these gentlemen, that human skill and experience have devised no better way of reaching a proper answer to that question than by the mode adopted by them in this case, and that is to ascertain, in the first place, the area of the whole water-shed of the Essex Company producing this 2,400 cubic feet per second for twenty-four hours, and then ascertaining what proportion of that watershed belongs to the Sudbury, which has been diverted; and if the geographical proportion of the water-shed which has been diverted is, say $\frac{1}{57}$ of the whole area, and if that $\frac{1}{57}$ is at least as good a productive area as the remaining $\frac{56}{57}$, then for all human and practical purposes you have the best and surest method of arriving at the amount which is furnished by that $\frac{1}{57}$ in the one case, and which is lost to us by its diversion in the other. Well, now, upon that point, gentlemen, there is, — I think I do not state it too strongly, there is absolutely no contradiction; and you will not fail to give to that consideration all the force to which it is entitled when you perceive how vital it is, not only to the petitioners but to the respondents, in arriving at a true conclusion in this case, and how open and accessible to the respondents have been all the means desirable to controvert the position which we have taken in this respect, if that position were in any particular, or to any extent, incorrect or unsound. If there had been the least exaggeration on the part of our witnesses in defining the limits of this area, or in characterizing it as a water-shed, the respondents have been in the position, unquestionably, to meet and to criticise, and to overcome whatever was wrong or exaggerated, and to give to you the precise state of the case. I therefore submit, sir, as I did upon the other point, that in proceeding in the consideration of this case you may, to a degree, beyond what ordinarily, indeed seldom, happens in the course of judicial investigations, take as absolutely true that the area of the Sudbury is 1/57 of our total water-shed, and that in production it is at least $\frac{1}{57}$ of the whole area of the petitioners' water-shed, and that therefore the amount which is diverted by the action of the city, — the result of their action is to divert $\frac{1}{57}$ of the water which has previously flowed to our dam and furnished us with mill-power.

Mr. Child. We don't understand that the city admit that, Mr. Merwin. We don't understand that the city admit that the amount of water is $\frac{1}{57}$, although we understand the

area is $\frac{1}{57}$.

Mr. Merwin. I am coming to that, sir. I don't mean to say they admit in terms, although I have not heard it denied till now, and the whole argument of General Butler pro-

ceeded upon the assumption that it was not only $\frac{1}{57}$ in area, but $\frac{1}{57}$ in productiveness, and I have heard no intimation to the contrary; and in reply to the suggestion which has been made, it was distinctly admitted, — when we proposed to offer proof of the point, — it was distinctly admitted by respondents that the Sudbury area was, at least, as good as the remaining portion of the petitioners' area.

Mr. Child. We don't deny the areas, but we do deny

that the Sudbury dam is $\frac{1}{57}$ of the area.

Mr. Merwin. I don't care to discuss words with the learned gentleman, but this fact cannot be removed from the case. We offered, or proposed to offer, testimony to show that the upper Sudbury area was as good, at least as good, as any other portion of the petitioners' area for producing water and putting it upon their dam at Lawrence.

Commissioner Russell. As the average, was it not?

Mr. Merwin. As good as the average.

Mr. Child. We deny that. It is simply this, that the storage basins on the Merrimack river and Lake Winni-

piseogee make a great difference.

Mr. Merwin. That brings me to a consideration that I was about to advert to in another connection, but I might as well dispose of it here; and that is the suggestion on the part of the respondents that these petitioners are only entitled to what the respondents have been pleased to call "the natural flow of the stream." What the natural flow of the Merrimack or of the Sudbury, or any other stream in Massachusetts, is, or what is meant by that expression, I am at a little loss to know. If the gentleman's position or theory is correct, if I understand it, he would remit us to a state of nature, and you are to look at this stream and your calculations are to be based upon the condition in which this stream would be if civilization did not exist in Massachusetts; if the primeval forests still bordered on the stream, and population had not existed for centuries in the vicinity. Well, I beg to submit, gentlemen, that that is another gross fallacy and absurdity. question you are to determine is, What is the value of a millpower to the Essex Co. — of all their mill-power, what is the value to them of 2,400 cubic feet a second for twentyfour hours, as they receive it, and as they have been accustomed to receive it for the last thirty years? You are to take things as they exist, and as, in all human probability, according to your judgment, they will exist in the future; and if, because Massachusetts is a populous State, and, to some extent, a manufacturing State; and if, because Sudbury and Merrimack rivers have been used for manufacturing purposes, a larger or smaller quantity of water is enjoyed at the

petitioners' dam in Lawrence; and if you believe that in all human probability that state of facts not only exists, but will continue to exist, then the value of that water-power at Lawrence is to be determined with reference to those considerations.

Why, Mr. Chairman, you are called upon, for instance, to assess damages for taking a building upon State street, in the city of Boston, and the owner comes and testifies to his opinion of its value. He is then cross-examined by the learned counsel. Why do you appraise it at that value? Is not your opinion influenced by the consideration that at this time, and up to this time, for the last twenty or thirty years, State street has been a populous and important commercial centre; that banks are there; that insurance offices are there; that large commission houses are there? Do you not base your estimate somewhat upon these facts, and upon the probability that that state of facts will continue? Mr. Storrow, if thus examined, would admit (as he does in this case, which is a parallel case), "I do, most certainly." And is my learned friend, on the other side to say that in so doing, you are putting a value upon this property derived from artificial considerations? that you must take it in a state of nature; that you have no right to say that the banks shall remain there, the insurance companies shall remain there, or that commerce shall use it as a land channel, daily and hourly, for the next fifty years as it has for the last; that you must take it in a state of nature? I answer, in that case, precisely what I answer in this case. You take the case as it is; and if, as sensible men, exercising your judgment, your experience, and your recollections of the past, you believe that that state of things will substantially exist for the future, then those elements enter into the value of that property just as much as the brick, and the mortar, and the lumber of which it is composed; and, in fact, they are the things that give it substantially its value.

Therefore, gentlemen, if you believe that in the future, as in the past, the water of the Merrimack will be used, prudently and carefully, by the locks and canals, and the other proprietors upon that stream whose interest it is thus to use it, and that no material change for the worse will occur in that respect, then most certainly you do not go amiss when you give us at least what we enjoy to-day at Lawrence; because the evidence, as pressed by the learned counsel from the witnesses, was that the reasonable expectation is, not that the value of that privilege will diminish, but that it will increase from year to year as these concurrent streams are

more and more economized, and the water used to better ad-

vantage.

I therefore submit, gentlemen, — for I only propose, within the limited time, to indicate rather than discuss very largely the view which the petitioners take in this case, and I think that is all that will be necessary before this tribunal, — I therefore submit, that the City of Boston have diverted from the petitioners and appropriated what furnishes them ¹/₇ of their power at Lawrence; and the value of what they have thus taken is to be estimated in view of the circumstances as they exist to-day, and as they will probably continue to exist, according to your best judgment, in the future; and by the uncontradicted testimony of Mr. Mills (p. 90), Mr. Storrow and Mr. Frost, every gallon diverted at Framingham is just so much less to be enjoyed at Lawrence.

Now, what is the pecuniary value of the property which has thus been appropriated by the city? In the first place, I beg to submit, that when we are deprived of the opportunity of selling, I will say, as an illustration, three permanent mill-powers, as defined and explained by Mr. Storrow in this case, that is not the limit of the damage which we suffer, or of the property which is taken from us; for the testimony in this case also proves conclusively — and it is the result, not of conjecture, not of mere estimate, but it is the conclusion from the experience of the past thirty years — that the sale of a permanent mill-power by the Essex Company means not only that, produces not only that, but also implies and amounts to the sale of what is equivalent to one-third of a mill-power more. I mean one-third of a mill-power for every single mill-power. So that if three permanent mill-powers are taken from us, or the capacity to sell three permanent mill-powers is taken from us, we also lose, in fact, what is equivalent to an additional mill-power. The evidence upon that point is briefly this: that those to whom the permanent mill-powers have been sold, upon an average, at the prices which they have been charged, and which the lessees have been very glad to pay for surplus power, have used and paid for such surplus power as one to three; that the amount received from the sale of surplus power has been from thirty to thirty-three per cent. of the amount received from the sale of the permanent powers. You have the evidence, gentlemen, that that has been the case during the whole experience of the Essex Company. You have the fact that perhaps every owner of a mill-power there has machinery which he can employ in large excess of the permanent mill-powers of which he has a lease from the

Essex Company, and that the mill-owners are glad to use, from time to time, as their business requires, this surplus power, which, at any rate, will be cheaper to them than steam power, even with the engines already provided and in their mills. So that if by the deprivation of the Sudbury water the Essex Company have been deprived, or willbe deprived of three permanent mill-powers, as they certainly will upon the admitted calculations, our loss does not stop there; but, judging of the future by the past, we could sell not only these three permanent mill-powers, but we could sell to the lessees of these three permanent mill-powers sufficient surplus power to amount to at least one other power; and that is just as valid an element in our damage as every one of the permanent powers, and it is just as much a loss to us as a loss of either of the permanent powers.

Now, as illustrating the reliance which the mill-owners place upon this surplus power, and the good reason they have for relying upon it, you will not fail to notice the terms upon which all these leases are granted. It is a right to draw in every second so many cubic feet of water. If, in that second, that amount of water is not drawn, then the right of the lessee does not exist for that quantity of water; he cannot use it in any other second, and all that is not thus drawn is the property of the Essex Company, to be disposed of the same as any of their unsold water-power; and the amount of rent which the lessee agrees to pay in his lease is predicated, among other things, and quite as much, upon that as upon other things, upon that very consideration. The amount of rent is fixed in view of the fact, as well as of other facts, that if he does not use the power each second, it does not belong to him, but reverts to the Essex Company. Every bargain is made upon that basis, and the price which the lessee is to pay is regulated by that consideration as well as by the others which enter into the terms of that contract; and, therefore, you see that in dry times, in seasons when the river is supplying only this minimum of 2,400 cubic feet per second, a valuable property exists in the Essex Company besides the 145, or 165, or 185 permanent mill-powers, according to the way in which it is used. They have a valuable property in that portion of the permanent mill-powers which is not used by the respective lessees.

Now, it has been put into this case, by the learned counsel for the respondents, that by law a lessee can run his mill but ten hours in the day. Well, making an allowance for getting the mill into operation, etc., suppose that this amount of water is drawn but twelve hours in the day — which would be a liberal allowance, — there are four hours of the

evening, practically, every day during the dry season, when the Essex Company can store up for use the next day this amount of surplus power to be sold; and thus you see that any mill-owner on that stream, knowing that fact, knowing the condition of the Essex Company, knowing that he can rely upon the Essex Company to answer permanently his call for surplus power even after they have sold all their permanent sixteen-hour power, will provide, in erecting his mill and furnishing it with machinery, the means of giving the Essex Company a market for that surplus power, and also for power which is not permanent, but depends on the stages of the river; and, as the evidence shows, they have done it to an extent which in figures amounts to thirty, or thirty-three per cent., in dollars and cents, of all that has been received from the sale of permanent power. And thus, gentlemen, when we come down to figures, we find that if these mill-powers are used fourteen hours a day instead of twelve, the admitted quantity of water at Lawrence furnishes us with 165 mill-powers, and $\frac{1}{57}$ of that is substantially three mill-powers, which we claim — following to a mathematical result the data which have been given to you by these gentlemen — is the amount of mill-power diverted from us by the action of the city in taking the water of the upper Sudbury; and to that should be added one mill-power in value on account of the loss of the surplus power which we should inevitably, in all human probability, sell to the owners of those three permanent mill-powers, if the experience of the future is to correspond in any substantial degree to the experience of the past in that respect.

Although no testimony whatever has been introduced by respondents to impeach in any degree the accuracy of the estimates submitted by the petitioners as to the amount of water furnished by the Sudbury or Concord river, some attempt was made in that direction in the argument of counsel, by the use which he made of a passage found in the report of the Sudbury River Commissioners of 1862. The passage is as follows, page 21: "The four days commented upon above followed after a long-continued period of dry weather, some of which had been exceedingly hot, and the quantity of water then running in the river [the Concord] (there was being discharged at the dam about 100 cubic feet per second) was probably not greater than the ordinary

summer flow of the river."

If Mr. Storrow, who was one of the Sudbury commissioners, concurred in that statement at the time it was made, and if it is in any degree inconsistent with any testimony which he has given in the case (and it certainly is not), such incon-

sistency might be relied upon by the respondents to disparage the value of Mr. Storrow's testimony in this case, but for no other purpose. The attempt which was made in the argument to use this passage as substantive proof as to the amount of water in the Concord river at any time was clearly contrary to the well-settled rules of evidence. This attempt had much more of ingenuity than candor in it, for, if the respondents believe that 100 cubic feet per second is the minimum constant of the Concord river at the Billerica dam; if they believe, or ask you to believe, that the capacity of any of these contributing rivers is less than our estimates, why have they not introduced some testimony upon that subject?

Could they not measure, have they not measured, not only the Concord, but the upper Sudbury? and if those measurements are now withheld, can it be for any other reason than that they would fully confirm the conclusions which the pe-

titioners ask you to adopt?

What, then, in dollars and cents, having ascertained the amount of mill-power which is taken from us, is the compensation which we are entitled to? In other words, what sum will place the Essex Company in a position equivalent to that which they would occupy if these three or four mill-

powers had not been, in fact, destroyed?

Well, gentlemen, what is the value of a mill-power to the Essex Company at Lawrence? Ordinarily, where sales of any article have taken place for a series of years, the amount thus realized furnishes a fair test or criterion of the value of the article, and the damages that will be allowed for it. But all the conditions and circumstances under which that sale is made, and that price is fixed, certainly are very material to be taken into account in determining the question of value. It is certainly so in the present case, where these mill-powers are not taken to be used upon the premises, or upon the lands of the Essex Company, but where the power is, in one sense, I may say, annihilated; where the power is taken to be used in the City of Boston instead of upon the banks of the canals of the Essex Company at Lawrence.

Now, the average price for several years past of a mill-power sold by the Essex Company has, under certain conditions and circumstances expressed in the grant, been \$20,000, it is true; but it is also true, that those sales have been made to persons who were also to purchase lands for a mill-site, factory, dwellings, and all the other buildings which are commonly incident to such an institution; and, as you have heard from the testimony of Mr. Storrow, the sale of a mill-power financially means, taking into consideration these attendant circumstances, \$35,000 to \$40,000, at least,

to the Essex Company; and in the illustration which he gave of a sale to Mr. Greenbank, I believe the actual amount was \$36,000; but the average is from \$35,000 to \$40,000.

Now, gentlemen, it would be great injustice to the Essex Company, in determining what amount of damages they have sustained at the hands of the City of Boston, to measure their mill-power thus taken away by the sum of \$20,000, because they never sold, never would sell, and could not sell, profitably, or judiciously, a mill-power in that way for the

sum of \$20,000.

What the Essex Company have sold for \$20,000 has not been an absolute right to a mill-power, but a right to be exercised under certain conditions and limitations. These conditions enter into and make a part of the consideration for which the mill-power is sold, quite as much as the cash payment, and their pecuniary value to the Essex Company has been, on an average, not less than from \$15,000 to \$20,000 for each mill-power sold.

Now, if a mill-power is to be sold, or, rather, is to be seized from the Essex Company and enjoyed by the City of Boston, freed from these conditions, its full value, including the value of these conditions, is the criterion of value fixed by the sale, and is the measure of the amount of damages which should be paid to the Essex Company. If less is paid, full compensation will not be made, and injustice will be done.

There is also another class of considerations bearing upon

this question.

When a manufacturer owns a mill-site upon the banks of a stream, and you are called upon to estimate the damage which he sustains by the destruction of his water-power, you must take into consideration, of course you would take into consideration, his investment, the situation of his mill, and other incidents; and it is the damage to the entire property which is the loss he suffers, and not merely to any abstract valuation of the water-power as an entirety by itself, and as distinct from the other incidents which belong to it. this case, you find the Essex Company the owners of this water-power and the land upon which the factory is to be erected, and the work carried on. For purposes of convenience to themselves they have distinguished between one and the other in making a sale to any particular lessee; but a mill-power, in effect, means the sum of from \$35,000 to \$40,000; and by no other rule can you arrive at substantial justice in this case, because you cannot exclude from your consideration the conditions under which these sales for \$20,000 have been made, any more than you would exclude from your consideration the fact that a mill-owner had built

upon his mill-site a factory, and placed in it machinery, and had otherwise equipped himself for the purpose of carrying on his business, when you came to estimate his damages by

the withdrawal of his water-power.

I am not asking, you see, gentlemen, in this connection, for any damages which, according to the definition of my learned friend on the other side, can be considered as remote, or indefinite, or contingent. It is damage which we suffer by the destruction of our mill-power, to the power itself, and to the property which is legally incident to that power; the mill-site itself, the property which goes with it, enters into it, and makes a part of it just as much as the water of the stream does.

But there is another view to be taken of this subject, and it will enable you, I think, to arrive at what is just and proper under these circumstances. The Essex Company own a certain amount of mill-power upon that stream. They have the right to sell it, or they have the right to use it. You can only indemnify them by placing them in a position where they can buy the amount of power of which they are de-I know of no other rule of justice or of law than this: If you deprive a man of his property, which has a fixed value, you must give him a sum which will enable him to supply its place with its equivalent; and, certainly, in reference to a mill-power there can be no other rule of justice than this, and especially where a large investment has been made, as in this case, or in any case where a mill proprietor has established his works. If you take away his water-power you must give him money enough to perform the work of the water-power which you have taken away. If you have taken away from him sixty horse-power, or one hundred horse-power, and that power has been a permanent power not a fluctuating one, to be used one day in a week or one day in a month — but if it has been a permanent sixty or one hundred horse-power, you fail to indemnify him, you fail to do the duty which the statute has committed to you, unless you give him such a sum as will enable him to supply, from other sources, the power of which you have deprived him. In other words, unless you give him the means to create by steam (which is the cheapest and best known equivalent at this day for water-power) the power of which he has been deprived. Well, gentlemen, what is the evidence upon that point? You have this fact as fixing what that amount is that the mill-owners upon that stream (and probably they are as good judges of what is expedient and right as any men — the largest proprietors in this direction of any we know) are glad to pay twelve dollars per mill-power per day rather than start the engines which they have upon their premises to create this steam-power. I think, therefore, gentlemen, you may safely assume that \$60,000 is a moderate estimate of the value to us, or to anybody upon that stream, of a mill-power; for, according to the lowest estimate, it will cost that sum to substitute by steam the power of which we have been deprived. Four dollars a day is \$20,000 for the water-power, and twelve dollars per day is \$60,000; and when the City of Boston took, as they have taken, from the petitioners these four mill-powers, the only mode in which full indemnity can be secured to the Essex Company for that deprivation is by giving them a sum which will reproduce those mill-powers at that spot, which is the sum of \$60,000 a mill-power.

The just amount of our compensation is not to be affected by the suggestion that these mill-powers might not have been used by the Essex Company for an indefinite period.

There is but one rule of law or of justice on this subject. When property is thus taken, its full market value, at the time, must be paid, and the moment that you undertake to discount anything because the sale takes place now, the price from which the discount is to be made is not the price at which sales take place now, but the price of the distant future — and that is too indefinite for you to fix. The inference that only one power is sold each year is based on starting, Oct. 2, 1869; thirteen powers were sold Oct. 1, and we might as well say that thirteen a day is the rate.

These mill-powers are, in legal effect, now sold to the City of Boston, and they should not stand, certainly, in any better position than an ordinary purchaser, because the sale is

compulsory, and at their election, and not ours!

There is another item of damage which comes within the objection of the learned counsel on the other side. I do not mean to say that the objection is valid; but I mean that his objection applies to it; and that is, the damage which is sustained by the Essex Company to their other lands by virtue of their water-power being diminished. I do not propose to add anything in reference to that particular claim to what appears before you by the tables and the considerations which have been submitted to you by Mr. Storrow in his testimony. Whatever you deem just and reasonable on account of that you will allow as a distinct sum.

There is only one remark which I wish to make in answer to an argument which was very much pressed by my learned friend on the other side. I have substantially answered it, I think. The counsel for the respondents has much to say in reference to the proposition that we were entitled to no dam-

ages, unless we had suffered an "appreciable" loss, and that we had suffered no "appreciable" loss. That argument was based upon the assumption that Mr. Storrow and Mr. Mills had testified that they had suffered no appreciable loss. Well, that is an entire misrepresentation, or mistake of the testimony, or its effect. The testimony of those gentlemen was, that in that large stream, and with the fluctuations to which it is naturally subject, a variation of three per cent. in the amount flowing on any particular day, more or less, as compared with any previous day, could not be mathematically ascertained and determined. But, to show the fallacy of this argument, — is it to be pretended that when the City of Boston took the whole of Sudbury river above their dam, amounting to millions of gallons a day, which, confessedly, under any estimate (I mean by the concession of the other side), amounts to from one to three mill-powers, and a millpower, according to any estimate, is worth \$20,000, that there is no appreciable damage in this case? Have the City of Boston appropriated and expended millions of dollars in the diversion of Sudbury river for the purpose of getting the benefit of a stream which is of no appreciable value, or measurable quantity? Why, gentlemen, let us pursue this for a moment. The City of Boston have taken $\frac{1}{57}$ of our water, and with it 1/57 of our water-power. That cannot be measured to-day on the dam of the Essex Company; but suppose, as we may well suppose, that fifty-six other parties, under fifty-six other acts of the Legislature of the State of Massachusetts, or upon their own authority, took each one 1 of our water area, and our water supply, and our waterpower. They are concurrent acts, or substantially concurrent acts, and the cases come before you for the assessment of damages. Well, each case is tried separately. learned friend, General Butler, begins, as he did in this case, "Can you measure your three per cent., or two per cent.?" "No."—Well, case number two is called.—"Can you measure your two or three per cent.?" as the case may be. "No;" and the grand result of that mode of argument is, that we lose our 57 and still have suffered no "appreciable" damage, and should go without day!

Gentlemen, I have only to conclude, as my learned friend on the other side did, by expressing my obligations to the Commission for the patience and kindness with which they

have listened to both sides of this case.

Commissioner Russell. Before you close, there is one argument which I think you have not adverted to, upon which I would like to hear what is to be said, and which, I

think, should be met. The question is, whether there is any difference between a navigable stream, and one not navigable, with respect to the rights of riparian proprietors, and whether there is anything which makes the Merrimack a navigable stream, which applies to that question? A case has been cited in Pennsylvania, which I have not had an oppor-

tunity to examine.

Mr. Merwin. I meant to have adverted to that in the early part of my argument, but forgot it. I intended simply to say upon that subject that there is no evidence in the case, and no fact stated in any other case, which authorizes the assumption that the Merrimack is a navigable stream, in the ordinary and legal sense of that phrase; but, on the contrary, that the charter of the Essex Company indicates, as far as anything is indicated on that subject, that it is not navigable, except for the purposes of floating rafts and logs, and for similar purposes. There is an act of the Legislature, to which I should like to refer the Commission, by which some persons, not unknown in this case, are incorporated for the purpose of rendering the Merrimack navigable, and, in case they do, authorizing them to take a certain amount of toll.

Mr. Storrow. It is the charter of the Pentucket Company. It provides that if they will make it navigable for boats of five tons, then they are to have the right to take toll forever, a right which the State could not grant upon a navigable

stream. (Chap. 115, Acts of 1867.)

Mr. Merwin. In the next place, the mill acts of this Commonwealth, as uniformly expounded and applied, apply to all streams, whether navigable or not, above the ebb and flow of the tide. In the next place, the right of a riparian proprietor on a navigable stream, as far as this question is concerned, cannot be in any respect different from one that is not navigable, in the nature of things; the right to the flow of the stream for power must exist, so far as its fall furnishes power, which the law has given us the right to use. And, in the last place, the distinction thus raised by General Butler has no application to this case, because the city of Boston is no riparian proprietor, either on the Merrimack or on the Sudbury, and has no rights as a riparian proprietor.

Commissioner Russell. It was with regard to the rights of the Essex Company, rather than the rights of Boston, that

the question arose.

Mr. Merwin. In reference to that, I propose to refer to our charter, which is conclusive, as it seems to me, upon that part of the argument of General Butler. That is what I forgot, and I am glad to have had my attention called to it. Our charter gives the company the right to create a water-power by the erection of a dam, and not only that, but it defines the limits to which that dam shall flow the water back; namely, to the foot of Hunt's Falls. The Essex Company are to *enjoy* the water-power thus created, and which is due to a dam which will set back the water of the Merrimack to the foot of Hunt's Falls. That right is a right which exists under our charter, and that is the most authoritative title that we can hold.

Commissioner Russell. I simply called your attention to the argument, because it seemed to be very much pressed on the other side.

Mr. Merwin. I had it on my notes, and I am much

obliged to the chairman for calling my attention to it.

Mr. Storrow. Will your Honors take the case of the Commonwealth vs. The Essex Company, 13 Gray, 239, for a judicial construction of our charter with reference to the right of the Legislature itself to interfere with the enjoyment of our dam, and the water-power created by it, for manufacturing purposes? I will also ask your attention to the cases of Heard vs. Proprietors of the Middlesex Canal, 5 Met. 81; and Ipswich Mills vs. County Com'rs of Essex, 108 Mass. 363.

I will also ask your attention to the case of Lowell vs. County Commissioners of Middlesex, 6 Allen, 131. There the question was whether the surplus water-power of the locks and canals was property in such sense that it could be considered for the purpose of taxation, after they had sold, as appears by the agreed state of facts, all the power that was permanent, and the Court held that it was. "The whole of the power which these works are capable of supplying throughout the whole year is used by the companies who own the stock. But for nine months in the year there is a considerable surplus of water-power, capable of a profitable use, but not yet applied to manufacturing purposes." The Court held that this surplus water-power was valuable for purposes of taxation, not perhaps by itself, for water-power and water-rights are not taxable, but as giving value to the land.

[Adjourned to Wednesday, September 27, at 9½ o'clock.]



Wednesday, Sept. 27, 1876.

THE SAXONVILLE MILLS, PETITIONER FOR ASSESSMENT OF DAMAGES,

vs.

THE CITY OF BOSTON.

COMMONWEALTH OF MASSACHUSETTS.

MIDDLESEX, SS.

To the Hon. the Justices of the Superior Court, within and for said County of Middlesex:—

The petition of the Saxonville Mills, a corporation under the laws of the Commonwealth of Massachusetts, established in the village of Saxonville, in the town of Framingham, in said County

of Middlesex respectfully represents, -

That on, and prior to the 8th day of April, in the year 1872, your petitioner was, and ever since has been, and now is, the owner in fee simple, and seized and possessed of certain land and real estate situated in said town of Framingham, through or along which the Sudbury river so called, passes, and in which is embraced the whole of an expansion of said river known as Factory pond; also certain land and real estate situate in said town of Framingham, on both sides of Farm-pond brook, so called, which brook is the outlet brook whereby the body of water known as Farm pond was, before the doings of the City of Boston hereinafter complained of, accustomed to flow into said Sudbury river; all which land and real estate are more particularly described in the schedule marked "A," annexed to and made part of this petition.

And your petitioner further represents that, as incident to and connected with said land and real estate, or otherwise, your petitioner was on, and prior to said 8th day of April, and ever since has been and now is, the owner of certain water, waterrights, mill privileges and rights of flowages of, in and upon said Sudbury river and Farm pond, and of the right to the use and enjoyment of the water and water-power of said river and pond, at and above your petitioner's said land for all lawful purposes, so far as said water, water-rights, mill privileges and water-power are or can be derived from, or said rights of flowage exercised by a head of $27\frac{98}{100}$ feet of your petitioner's dam across said river in said village of Saxonville, which dam your petitioner has the right to elect and maintain at a height of $27\frac{98}{100}$ feet, or from or by a dam known as the old grist-mill dam across said river about one mile above said first-mentioned dam, and between the parcels of land in said schedule A, described in items six and seven, which dam your petitioner has the right to maintain at a height of two feet above said first-mentioned dam, or from or by a dam across said Farm-pond brook, which your petitioner has the right to erect and maintain at any height it may choose within the boundaries of its said land, situated on both sides of said brook as

aforesaid, subject to certain conditions, provisions and agreements in the deeds of one Harrison Eames, referred to in said schedule

A, annexed to this petition.

And your petitioner further represents that at, and for all said time your petitioner was, and now is, the owner of extensive factories and mills, and a large amount of machinery connected therewith, and numerous dwelling-houses and other buildings and fixtures, situate on said land in Saxonville, in said Framingham; that said factories and mills are used for manufacturing purposes, and are and have been accustomed to be worked by water-power obtained from the said waters of said Sudbury river and said Farm pond, by means of dams, canals, sluice-ways, and the artificial structures and channels constructed upon your petitioner's said land.

And your petitioner further represents that the city of Boston, in the county of Suffolk and commonwealth aforesaid, under and by virtue of an act of the Legislature approved April 8, 1872, entitled "An act to authorize the city of Boston to obtain an additional supply of pure water," said act being contained in chapter 177 of the acts of 1872, and for the purposes in said act mentioned, have within three years last past, to wit, on the 19th and on the 25th days of June, 1872, and on divers other days and times between said 19th day of June and the date of this petition, first actually withdrawn and directed the waters of said Sudbury river and said Farm pond from their theretofore accustomed flow into and along the channel of said river, through, and by the land of your petitioner as aforesaid, by erecting a new dam across said river, above the dam and the land of your petitioner in said village of Saxonville aforesaid, to wit, at a point in said river near and below the mouth of said Farm-pond brook, and by constructing a ditch from the southerly end of said Farm pond to a brook known as Beaver-dam brook, which last-named brook communicates with Lake Cochituate, by means of which new dam and ditch the said city has caused the waters of said Farm pond and Sudbury river to be withdrawn, and diverted at or near the point where said new dam has been erected, and to flow through said ditch and Beaver-dam brook into said Lake Cochituate, instead of continuing to flow, as otherwise said waters would do, along the channel of said river below said new dam, and along and through the said land of your petitioner.

And your petitioner further represents that said doings of said city in the erection of said new dam and the construction of said ditch were, and are, in furtherance of a purpose of said city, under the authority of said act of the Legislature, to so withdraw and divert the waters of said Sudbury river and Farm pond into said Lake Cochituate, "or by other course to and into the city of Boston," that there shall flow in and along the channel of said river below said new dam only one and one-half million gallons of water a day, and are the first doings of said city, in pursuance of said purpose, whereby the waters of said Sudbury river and Farm pond have been first actually withdrawn and diverted as aforesaid.

And your petitioner further represents that, by the doings of

said city, and by the further prosecution of said city of its purposes under said act of the Legislature as aforesaid, whereby the waters of said Sudbury river and Farm pond have been actually withdrawn and diverted, and whereby the flow thereof in, and along the channel of said river below said new dam will be reduced to one and one-half million gallons of water a day, as aforesaid, the said water, water-rights, mill privileges, rights of flowage and water-power of your petitioner, have been, and will be taken and destroyed, or greatly reduced in quantity and force; and the same, together with the land and real estate of your petitioner, to which the same are incident, or with which they are connected, as aforesaid, have been, and will be, greatly lessened in value.

Whereby, and by reason of all, which your petitioner has sustained and will sustain damages in its said property and estate, in the sum of five hundred thousand dollars.

And your petitioner further represents, that it has not agreed with said city of Boston upon, or for the damages to be paid to

your petitioner on the premises.

Wherefore your petitioner prays for the assessment of its damages, sustained and to be sustained as aforesaid, and that this honorable court, after due notice to said city of Boston, and other proper proceedings had, will appoint three judicious and disinterested freeholders of this commonwealth, who shall proceed to assess said damages according to law. And that all such further and other proceedings may be had in the case as law and justice shall require.

Dated this 12th day of April, in the year 1875.

SAXONVILLE MILLS.

By M. H. Simpson, President.

SCHEDULE A.

1. Three parcels of land in Saxonville, Framingham, in the county of Middlesex, and Commonwealth of Massachusetts, bounded and described as follows: Beginning at a point on the westerly side of Elm street, so called, of land now or late of the Town of Framingham, thence running westerly 155 feet, and southerly 99 feet by said town land; thence westerly 165 feet by the centre line of a contemplated street in a straight line to land now or late of the B. & W. R. R.; thence northerly 245 feet 9 inches by said R. R. land to Sudbury river; thence northeasterly 162 feet by said river to a chestnut stump; thence north 52° W. in a straight line, crossing said river, and by land now or late of M. C. Byrnes to an elmtree on the side of the road known as Central street; then beginning again at a point on the opposite side of said Central street, and running southwesterly, and bounded southeasterly on said Central street, to a point 1,111 feet and 6 inches southwesterly from the corner of Central street and the road known as Water

street (measuring along the northwesterly line of said Central street;) thence running northwesterly in a straight line to the thread of the stream of said Sudbury river; thence northeasterly, and northerly by said thread of the stream for the greater part of the distance to land now or late of Abel Thompson; thence northeasterly in a crooked line along the northerly side of said river and the Factory pond, so called, and bounded by said Thompson's land, 76 feet, and by land now or late of Jairus Barny 667 feet to said Water street; then beginning again at a point on the opposite side of said Water street, at land now or formerly of said Barney, and thence rnnning northeasterly by said Barney's land 265 feet, to a white oak tree; thence running easterly by land now or late of Charles Fiske 313 feet, to said Elm street; thence running southerly, and bounded easterly by Elm street, 6741 feet, then crossing said Central street, and continuing to run southerly, and bounded easterly by said Elm street, about 6651 feet to the point of beginning first referred to on the westerly side of said Elm street. Said land, consisting of three parcels, more or less separated from each other by said streets, and containing respectively 7 acres and 4 rods 12 acres and 6 rods (including said factory pond), and 54 acres and 25 rods.

2. A parcel of land in said Saxonville, bounded as follows: Beginning at land now or late of Stone; thence running northerly, and bounded westerly by said Elm street, $235\frac{1}{2}$ feet; thence easterly by land now or late of the Town of Framingham $220\frac{1}{2}$ feet; thence northerly by said town land about $88\frac{1}{4}$ feet; thence easterly in a straight line $33\frac{1}{2}$ feet to land of said town (being old school-house lot;) thence southerly by said old school-house lot 69 feet, to land now or late of Pullen; thence easterly by said Pullen's land $165\frac{1}{2}$ feet; thence southerly by land now or late of C. Fiske $316\frac{3}{4}$ feet; thence westerly by said land of Stone 483 feet, to the point of

beginning on said Elm street.

3. A parcel of land in said Saxonville, bounded as follows: Westerly by said Elm street 211½ feet, northerly by Maple street, so called, 220 feet, easterly by Prospect street, so called, 208¾ feet, and southerly by land of said town known as the High-school lot,

220 feet.

4. A parcel of land in said Saxonville, with a meeting-house thereon, bounded as follows: Beginning at a point at the south-westerly corner thereof, distant about 8 rods easterly from the easterly side of said Elm street; thence running northwesterly in part by land now or late of Mrs. Stevens, in part by the end of a 33-foot lane, and in part by land now or late of C. Fiske, $208\frac{3}{4}$ feet; thence northeasterly by said land of Fiske, $208\frac{3}{4}$ feet; thence southeasterly, in part by the cemetery and in part by land now or lot of Pullen, $208\frac{3}{4}$ feet; thence southwesterly, in part by said land of Pullen, in part by a town road or passage-way, and in part again by said land of Pullen, $208\frac{3}{4}$ feet, to the point of beginning.

5. A parcel of land in said Framingham, containing one-quarter of an acre, more or less, situate around the stone bridge which passes over Farm Pond brook, so called, bounded as follows: Begin-

ning at the southwesterly corner, at a stake and stones by a small white oak, about one rod south of the east end of the old dam; thence northeasterly three rods to a stake and stones by a small black oak; thence southeasterly eight rods and and eight links to a walnut-tree; thence six rods and twenty-two links southerly to a black oak; thence northwesterly nine rods and twenty links to the place of beginning; with the right at all times to enter on land now a lot of Harrison Eames adjoining the southeast corner of the parcel described, and therefrom to take gravel sufficient to make and keep in repair a dam across said brook within the boundaries of the parcel described, and the right of erecting said dam to any height the owner of the parcel described may choose, subject to the conditions, provisions, and agreements contained in a deed from said Eames to the New England Worsted Company, of October 13, 1842, recorded Middlesex Reg. Lib. 422, fol. 221.

6. A parcel of land in said Framingham, containing 8½ acres and 14 rods, bounded as follows: Beginning at the northeasterly corner thereof, at a white ash tree on the southerly bank of said Sudbury river; thence running south 17 degrees, west 30 rods and 13 links, to the corner of the wall at the county road; thence north 63 degrees, west 2 rods and 6 links, to a stake and stones; thence north 3 degrees, east 20 rods, to a stake and stones; thence south 741 degrees, west 5 rods and 22 links, to a stake and stones one rod south of a chesnut-oak on the bank of said river; thence south 85 degrees, west 13 rods, to a stake and stones; thence north $66\frac{1}{2}$ degrees, west 16 rods, to the end of a wall; thence north 88 degrees, west 25 rods and 2 links, to a poplar-tree marked; thence north 85\frac{1}{4} degrees, west 29 rods and 5 links, to a stake and stones, now or formerly of Nathan Kendall; thence north 25½ degrees, east 13 rods and 15 links, on land now or formerly of said Kendall, to said river; thence easterly by said river to the point of beginning.

7. A parcel of land in said Framingham on the opposite bank of said river from said last described parcel, containing 1½ acres and 21 rods, more or less, bounded as follows: Beginning at a stake and stones at the easterly corner on the river bank a few rods above the white ash tree mentioned in the description of the last described parcel; thence north 45 degrees, west 12 rods, to a stake and stones; thence north 71 degrees, west 17 rods, to a small white oak; thence north 77½ degrees, west 8 rods and 14 links, to a stake and stones by land now or late of Capt. Adam Hemenway; thence south 52½ degrees, west 2 rods and 18 links, to a swamp white oak on the river bank, by land now or late of said Hemenway; thence easterly by said river to the first-mentioned bound. The boundaries of this parcel and of the parcel on the opposite bank of the river before described extending to the centre of said river wherever either of said parcels are contiguous to the river.

8. Also the right of flowing and inundating with the waters of said river a certain tract of meadow-land in said Framingham, on the south side of said river, between land now or late of Gilman Meader, and land formerly of T. R. Hoynes, containing three acres, more or less, and bounded northerly by said river, and on

all other sides by upland now or late of Eben Stone, said land to be flowed as high as the water will flow where the dam above the factory of the Saxonville Mills is at the height at which it was Oct. 17, 1848, subject to the reservation in the deed of said right of flowage made by Ebenezer Stone to the N. E. Worsted Co. (from whom the Saxonville Mills derived the right), dated Oct. 17, 1848, and recorded on the Middlesex Deeds, Lib. 559, fol. 197.

9. All the lanes, avenues and passageways mentioned or referred to in the foregoing description of parcels numbered 3 and 4, and

the land embraced in said lanes, avenues and passageways.

10. All the water, water-rights, water-powers, mill-privileges, and rights of flowage, incident to or connected with either of said parcels of land in this schedule described, and all the other rights, ways, easements, privileges, appurtenances, to any of the same belonging or appertaining, and however otherwise than as aforesaid any of the same may be bounded or described, and be any of said admeasurements more or less. The above-described lands, rights, and hereditaments being the same conveyed to the Saxonville Mills by John C. Lee and others, by their deed dated March 4, 1859, recorded with Middlesex S. Dist. Deeds, Lib. 812, page 307.

AMENDMENT TO PETITION.

Commonwealth of Massachusetts.

Middlesex, ss.

SAXONVILLE MILLS, PETITIONER, vs. CITY OF BOSTON.

And now the said petitioner comes and asks leave to amend its petition, by inserting often the words " $27\frac{98}{100}$ feet," where they secondly occur on the second page of said petition, the following words, viz:

"Or from or by a dam, known as the 'old grist mill dam,' across said river about one mile above said first-mentioned dam, and between the parcels of land in said schedule A, described in clauses numbered 6 and 7, which dam your petitioner has the right to maintain at a height two feet above said first mentioned dam."

By its Attorney,

E. F. HODGES.

DEFENDANTS' ANSWER.

SAXONVILLE MILLS VS. BOSTON.

And now comes the defendant, and for answer says that they do not know whether the petitioner is the owner of the land, buildings, mill and water privileges set forth in said petition, but leave the petitioners to prove the same.

And said defendants further say that they admit that under the

acts of the Legislature for the year 1872, chap. 177, they are authorized to take the waters of the Sudbury river, under certain restrictions, and, in accordance with the provisions of said act, the Mayor and Cochituate Water Board have filed a certain statement of such taking in the Registrar's office, for the Register of Deeds, in the county of Middlesex, to which reference is had for greater certainty, and the defendants admit that they are liable for any damages or injury to which the petitioners are legally entitled, for

the taking of Sudbury river and Farm pond.

But the defendants deny that the petitioners are legally entitled to any damages, for any injury to the property described, or that any act done or taking made by them has as yet or ever can do the damages and injuries set forth in said petition. That any damage there may be to the houses and buildings, other than those used for manufacturing purposes is remote, and consequential, and the petitioners are not legally entitled to the same. That, as to the damage to or taking away any water rights that are are claimed under said petition, the water has not as yet been actually diverted, and, until such actual diversion, the petitioners have no right to bring their petition under said act. That if there has been any such taking by the defendants, it was more than three years before said petition was brought. That under said act, the defendants have power to take a certain amount of land bordering upon said stream, and that commissioners should not be appointed until said defendants shall have had a reasonable time to determine action in that regard. The defendants further claim that under said petition, the damages have not been set forth sufficiently to comply with the provisions of the said act, and the defendant have not that description of the damages done to which they are entitled, so that they may determine whether any tender for such damages, and if so, how much should be made.

And the defendants admit that when the statement is properly made of the damage to which the petitioner is legally entitled, then the commission prayed for should be appointed by this court.

OPENING ARGUMENT FOR PETITIONERS, BY E. F. HODGES, Esq.

Mr. Chairman and Gentlemen of the Commission: —

This, as you have been apprised, is the petition of the Saxonville mills, a manufacturing corporation of the Commonwealth, against the city; and I read from a copy of the petition which we have retained in the office, not having procured the original. It is not a matter about which there will be any question, so far as that goes, and if there is, we will procure the original if there is any occasion.

Mr. Butler. I have no objection.

Mr. Hodges. Perhaps it may be a mere matter of form

to read the petition; it may be important in itself.

Mr. Butler. I hardly think it is worth while, unless you think it is. I make no objection to form or substance either.

Mr. Hodges. If anything is needed, I will refer to it, and at your request will call for it. I will, then, simply say, that the petition has annexed to it a description of the locus in quo, somewhat specific; as to that, I will not unless requested by the counsel for the defendant read it, for it will take time; but I will take occasion, as we may need so to do, to refer to the boundaries or descriptions, with the understanding that I refer to them accurately as they are described. I do not understand that we are to encounter any question of title.

Mr. Butler. There is no question here of title, or of boundary at all. The simple question is, what ought to

be the only question here, — a question of damage.

Mr. Hodges. I also understand that there is in the files of the Essex case, to be continued into this, as in other cases, a copy of the certificate of taking,—if that is the proper expression to be used; and in that, we hold ourselves to be relieved from very much of the formal parts of the proceeding. The defendant's answer I will read or not, as General Butler may desire.

Mr. Butler. I do not see that there is an occasion. We

raise no issue except one of damages.

Mr. Hodges. You raise no issue except one of damages, and if I remember right, this case is not embarrassed by the existence of exceptions. In that view, gentlemen, the opening of this case will be confined to a brief statement of the proofs we propose to make. Those, in reality, confined rather to the classification of proofs than to the statement of details.

You will have observed, in taking a view of these lands, that the Saxonville Mills own the whole of the water-fall at the point where the stone dam is raised whence the water is taken to the mills; that is, that the corporation has no joint proprietorship with any other party in any of that water. The corporation likewise owns the mills, the dam, and the surrounding property appertaining to the mills—like freighthouses and other outbuildings. It likewise owns at that point a large number,—and we will show you substantially how many,—a large number of dwelling houses, with surrounding lands. You will have observed, likewise, that those are in turn encompassed by the usual conveniences and

surroundings of a large country village; and it cannot have escaped you, that all of those are dependent very directly - in some cases, possibly, somewhat remotely—upon the existence of the manufacturing operations dependent upon that water power; that these are the results of the labors, the ingenuity, and the earnest purposes of those manufacturers who have found that upon building a manufacturing establishment, they must surround it with instructed and reliable operatives, who are, with themselves, dependent upon the force of this power. Whatever there is in that village, whatever there is of beauty, whatever there is of utility, whatever evidences exist there of advanced and progressed population, is dependent upon, and has grown out of, the utilizing of that water-power. We are inquiring, not under what right it is that the city has taken from that place the force that has brought those people together — that is no part of our duty, or or right; but we do ask, and we shall ask you all the way through, gentleman, to consider those things in forming your judgment, and bear in mind, that this property has been taken from us, not by matter of bargain between the city and the proprietors, but by force of a rule, by force of that great rule — eminent domain — important, it is true, in the existence of government and of society, but doubtful in its application. And whenever and wherever applied, it must be done under the great rule, that the taking party pays for the property that he takes, and pays for it, gentlemen, not as he might sit down and bargain for it, or, more particularly, not as he might come to you and show what it is worth to him, the taker. He takes it at his option. If it is not worth what he is to pay for it, he should not take it; but he is not to measure the value of what he has taken by what it is worth to him. He measures the value by what it is worth to the party from whom he has taken it. The taker stands in that respect, — using the term in no offensive sense, — precisely in the position of the spoiler recognized in the law, against whom everything is to be presumed; and in measuring what we are to have for the destruction that has been wrought upon us, you, gentlemen, will consider that we are entitled to receive what the property is worth that the city has taken, - what it is worth to us, - and, again, what damage is done to what is left.

Beginning with the first claim that we make, and where I shall, if the witnesses arrive in season, endeavor to commence my proof, — beginning at Farm pond, the petitioner is proprietor of a tract of land surrounding and embracing the outlet of Farm pond, controlling the waters that are therein. The testimony already in, shows that Farm pond

may be raised one or two or more feet, Whatever right there is to raise the waters of Farm pond, we own, and shall ask you to award damages therefor. The right is to control the outlet, and measure out the water from Farm pond and the river below at our will, together with the right under the mill-acts to raise that dam, and thus raise the waters of Farm pond one or two feet, and control that much more of reserved water. Below that, you, gentlemen, will remember was what was pointed out to you as the grist mill-dam. dam has been in existence nearly as long as the waters of Sudbury river have been appropriated to the uses of men. It formerly, and down to 1865, I think, was occupied by a grist-mill and saw-mill, and at times some other minor The waters of machinery. It then had a fall of six feet. Farm pond, it will be borne in mind, fall into the river above that dam. Down to the time of its destruction by fire, it was subordinate to the rights or commands of the mill below, but was employed as a reservoir or retaining basin for whatever amount of water it was capable of holding. After it was burned down, the proprietors of the mill below, the present petitioners, instead of rebuilding the dam, purchased, at very great expense, the lands upon the shore of the pond below it and rights of flowage upon it, and raised the dam at the pond that we viewed, — that is the one of most importance in this case, - raised that dam four feet, thus giving to them a fall of about twenty-six feet — twenty-five feet and some ninety odd hundredths; retaining a fall of about two feet at the grist-mill, and the right of all the flowage that that dam would give, and increasing the flowage below all that it could be increased by raising the dam four feet. Now, whatever of value there is in the grist mill-dam, with its appurtenances and consequences, we shall ask you to weigh and to give to us; and that value is to be estimated by you at what it is worth to us in view of our proprietorship of the fall below and the pond above. The two feet of fall that is there retained may to-day be profitably appropriated for mechanical purposes. The right to retain the water back by means of that dam, is a right correlative to the other, and important in view of the uses below. We shall ask you to give us damages for that, to the amount to which we are entitled under a fair estimation.

We come now to the mill below. That water-power has been utilized for the best part of this century, first as a flannel mill, then as a broad-cloth mill, beginning about 1830 as a broad-cloth mill; then, coming, I think, about 1837 into the possession of a corporation known as the New England Worsted Co., it was converted into a worsted and blanket

mill, the purpose to which it is now devoted. Down to the date I have mentioned in my last paragraph, 1865, the fall was about twenty-two feet. It employed machinery at that time ranging all the way from 300 to 330 horse-power probably about 300. Down to the autumn of 1844, it was run entirely by water-power, employing the old breast-wheel; the water controlled by a dam varying in capacity about midway, I should judge, from a cullender to something water-tight. With that water, and these appliances for its use, the machinery was run until the autumn of 1844, when an engine rated at about eighty horse-power was introduced, and introduced under these circumstances: In the season of 1843 (in this it is possible I do not give the exact year, but I think I do, and the witnesses will correct me if I do not) in the season of 1843, a very great drought prevailed during the summer, so much so that the mills practically suspended their operations for three weeks; a little was done, but the most of the work was suspended. The consequence was, that an engine, rating, I think, at eighty horse-power was put in during that season, in the winter of 1843-44, and prepared for operations. I should, perhaps, have said, if I have not, that the water carried two or three breast-wheels at this time; there was no turbine wheel in, and the whole power was made by the water upon those breast-wheels. The mills at this time consisted of three; what are known, and were shown to you, gentlemen, as No. 1, No. 2, and No. 3, since destroyed by fire. The machinery in each was run by a separate wheel. In 1846 a turbine wheel was put in, now employed in mill No. 1, and a small engine was put in after that (the date will be given you) for No. 2. No. 3 depended entirely upon its water-power. Still subsequently, the engine that was put in the first mill was removed, and the present larger engine put in. During the war, the demand upon the mill was so great, that it become necessary to connect the shafts of mill No. 2 with mill No. 3, and the reason for it was this: mill No. 3 prepared all the stock for mills No. 2 and No. 1. It was not possible to allow that mill to stop for repairs; consequently, the shaft of No. 2 was lengthened, extended across the way into No. 3, and thus the machinery of No. 3 could be carried by that shaft when it was necessary. It was done at a time when it had become necessary to make repairs upon the wheel of mill No. 3, and thereupon they put in the small turbine wheel at mill No. 3, which was there when it was burned. In 1865, mill No. 3 burned down, and the machinery, or corresponding machinery, was accommodated in No. 1 and No. 2, with such additions to No. 2 as have been made — the part which extends back,

where we saw a quantity of worsted machinery crowded

together, drawers or spinners.

At about that time the dam was raised, as I have stated to you, and to-day there is running in the mills, all of them, machinary equalling for power thirty and possibly fifty horses in strength beyond what was used in early times, when it became a worsted mill.

I have stated thus somewhat in detail, and, possibly, tediously, the incidents in the history of this mill; but it has been done, gentlemen, for the purpose of enabling us to reach fairly, and with as complete accuracy as the subject will admit, the power we have there. We have not, for a series of years, expended large sums of money in keeping gauges and measuring the amount of power. All owned by one corporation, nobody associated with them, they had what power there was, and measuring it would neither make it more nor less; and in all these years, there was as much prospect of the City of Boston, or any other place, taking Niagara, as that they should take Sudbury river. There was, therefore, no occasion for the corporation to, in any degree, inquire into its power, beyond what was necessary in order to know what machinery they would put in. shall be compelled, therefore, in reaching the amount of power that we have, to employ the evidences of, first, such tables as we have to use; second, such theories as apply to all areas of rain fall; and, third, such proofs concerning the amount of labor done by those mills, as we can furnish you; and from these we believe we can arrive at a substantially correct result. We have already seen, that with all the appliances of science, with the infinitely minute distinctions that can be made by the mechanism of the hydrostatic engineer, all of those matters, in the end, are not of absolute certainty. We are without those aids; but such as we have we shall furnish you, and shall endeavour to present to you all the people who know anything about it, and are capable of examination; and from these witnesses, and the evidences that are before you, and the deductions that are to be made, we shall hope to arrive at what will be a satisfactory result to both parties in this case. We have no idea, it is proper to say, that the city desires to take our property and not pay for it. We differ as to what we should receive.

It is proper to say here, and have it go upon the notes, that the petition in this case was brought in April, 1875, within three years from the taking of the water in 1872, and after the taking in 1875, so that whichever one is considered as the taking, in a technical sense (if, indeed, either of them is to be considered as the taking, which I am warned is

denied by the counsel for the city), we shall be within the law.

Mr. Butler. — I stated to you, Mr. Hodges, that we should not make any dispute as to title, and we do not intend to generally; but there is one matter which we must put in dispute. If you claim any right to use Farm pond as a reservoir, and therefore that our taking it deprived you of that advantage, then we claim that you have no right to Farm pond as a reservoir for this reason; as we are instructed (I want to put you fully upon inquiry) that you once owned, or thought you owned a quarter of an acre of land on which the old dam which the commissioners saw there was placed, and which has gone into decay, and that dam you hold a right to raise a certain number of inches or feet on the pond, and hold it if you owned the land; but you had no right beyond that; you paid for flowage no higher than that dam flowed. Then the Methodist society came and bought the land around Farm pond for campmeeting purposes; and they claim this quarter of an acre on which your dam is placed, and they claim to own it by title. We have settled with the Methodists for their damages, and the Methodists have undertaken to warrant and defend us against any claim for that quarter of an acre of land. papers have not been passed; but that would not affect the title at all. If they own it, you do not; and if you do not, they do or somebody else does. So that we shall call upon you to show title to that quarter of an acre of land, and if you want any time to do that, you can have it.

Mr. Hodges. You and I will not disagree about that. Let us, however, at this point, understand. We claim that land, and with it claim the right to flowage; first, so far as that title then gave us a right to flow, a few inches, as you have stated it. Then whatever right proprietorship in the outlet of that pond gives to flow under the mill acts, that we claim. Now, it would delay many people for me to fumble over the deeds to find that deed; but we have a deed of that quarter of an acre, and whatever that gives us, we shall ask for. But I will save all embarrassment about it by, in the end, asking the commissioners to award whatever damages they find for that in a separate amount. That will settle all questions.

Mr. Butler. Perhaps that will be the most convenient way. Any way to get at our exact rights, because we recognize that we have done you substantial damage, and are willing to pay for it; but we do not want to pay any more than you are entitled to. We recognize that your claim is a substantial, not a fanciful one.

Mr. Hodges. Then, gentlemen, what I have to say in

the opening will be closed when I re-state to you what I believe to be our rights in principle. We believe we are entitled to all the damages that have been done to us by taking away our property, and that those damages are marshalled under two heads: First, the value to us of what they have actually taken away; and next, the damage that that taking has done to what remains to us. And those two laws will apply alike to each branch of damage that we have suggested to you, — that done at Farm Pond, at the grist-mill, and at the main dam. Again, we believe that we are entitled to damages resulting at the village of Saxonville from the depreciation in the large amount of real property owned by us and occupied by parties dependent upon the power that the city has taken away. And I would point to one feature simply of that damage. Taking this water away leaves exposed a large surface, measured, more or less, by one hundred acres of land hitherto covered by water, and now left offensive to the sight, and destructive to the health of all in the vicinage. All of these circumstances we seek to have considered, asking never that you shall pass that line which divides actual from remote damage. We probably should not disagree in the principle with the counsel for the city as to what the duty of the tribunal is concerning that. might disagree about the exact point where that line fell, but that that line existed, and that one side of it the tribunal could adjudge damages and the other side they could not, we should not disagree. In that view, gentlemen, I shall leave this case to your consideration after hearing the witnesses we shall call.

I have not, in the opening, General Butler, said anything

about the taking of the water.

Mr. Butler. In this case, it will be agreed that the Water Commissioners took the water from June, 1872, until September, 1872.

Mr. Hodges. For seventy-five days.

Mr. Butler. Yes, through that plank ditch which we saw on crossing over; and then that sluice-way was stopped up and no water taken through it until January, 1875, when it was opened and water was taken to an amount that will be shown, and continued to be taken, by the Water Commissioners, acting under the authority of a vote of the Common Council of the City of Boston, and then the Water Commissioners and Mayor filed a taking, a copy of which has been put in, about the 20th of January, 1875.

Mr. Hodges. The 21st of January. Water was taken from the 21st of January until the 11th of October—for 143 days; not all the time, but 143 days during that period.

Commissioner Russell. Did the taking of the water con-

tinue after the filing?

Mr. Butler. Yes, sir. I will take it exactly from City Document No. 103, — the report of the Cochituate Water Board for the year ending April 30th, 1876:—

"An order of the City Council authorizing the Water Board to take the waters of the Sudbury river, was approved

January 20, 1875."

"On the 21st of that month, water from the river was turned into the lake (its water surface at that date standing below the conduit bottom, and the supply to the conduit kept up by pumping) and allowed to flow till March 18th. The connection between the two sources has been kept open during the year, from January 21st to March 18th, from March 26th to April 4th, from April 6th to 14th, from May 3d to 10th, from June 3d to 10th, from July 14th to August 26th, and from October 2d to 11th, or 143 days in all; the total flow being 2,555,800,000 gallons, equal to a supply of 7,000,000 gallons per day for the whole year. It has been open this year (1876) from January 12th to 18th, and from January 21st to February 19th.

"No water was wasted at the overflow of the lake during

1875" (p. 16.)

Mr. Butler. We are content that the damages for the taking in 1872 may be considered in this case, whether it was by right or by wrong. We will assume, for the purposes of this case, that it was by right. We could not assume it in the Essex case, because they have sued the Commissioners. I will also read, to get at the exact facts, again, from the report of April 30th, 1873, p. 23:—

"An act was passed, early in April, granting the right to take water from the Sudbury river and turn it into Lake Cochituate, and the work required for this purpose was at once begun.

"In a report to your board, made last May, a full description of this work (then in progress) was given. Its chief features are a wooden dam across the river, and a ditch from Farm Pond to Beaver Dam Brook, passing through swamp and meadow lands of a nature that requires the sides of the ditch to be sustained by planking and bracing. With the exception of a bridge over the outlet of Farm Pond, it is now finished. It is of a temporary character, intended, with proper attention and repairs, to last four or five years, or until a new conduit may be built connecting the river with Chestnut Hill reservoir.

"Water was first let into the ditch June 19th, and was run each night until June 25th., to draw down the level of the pond and permit the deepening at the mouth of the ditch. On June 25th, water from the river was turned into the pond, and from thence let into the lake, and the flow was continued uninterruptedly until August 7th, when it was stopped to finish the side-planking of the ditch. August 16th, the communication was again opened, and was kept open till

September 17th, when it was closed for the scason.

"The quantity of water received from the river during the summer cannot be very accurately ascertained, as during the time of flow a number of changes were made in the section and capacity of the water-course, Rough gaugings were made, however, and the quantity computed from them is 1,676,600,000 gallons, or equal to the supply required in the city, taken at the average for the year, for 110 days."

Commissioner Russell. Do I understand that the city agree that in the assessment of damages, any damage sustained by the temporary taking of the water from June, 1872,

to 1875, may be considered?

Mr. Butler. That may be taken into consideration in this case, but not in the other, for reasons which are controlling, one of which I have stated. That is to say, we must have a full and perfect agreement on both sides, otherwise we might have it taken in by you, and in the course of six years a suit for trespass brought.

Commissioner Russell. But that would not affect the question of interest upon damages, by dating back the taking

to the year 1872?

Mr. Butler. No, sir; I don't mean to do that.

Mr. Hodges. We should not ask you to date back to the year 1872 with a view to getting interest.

Mr. Butler. You may date back for interest on whatever you find that taking to have been; but not interest on the

general taking, for that would be unjust.

Mr. Hodges. No, sir; I am inclined to think that we shall approach this matter more intelligently by calling a a witness whom we had to examine the machinery in the mill, and take measurements of the power required to operate it. I will, therefore, call Mr. Samuel Webber.

SAMUEL WEBBER, sworn.

Q. (By Mr. Hodges.) What is your occupation?

A. Civil engineer.

Q. How long have you been engaged in that?

A. More or less for 25 or 30 years.

Q. Is there any particular department of civil engineering to which you have given your attention?

A. The last five years entirely to questions of power.

Q. Mechanical power?

A. Yes, sir.

Q. Are you or not familiar with the use of the dynamometer?

A. Pretty thoroughly, I think.

Q. If you have been called upon, will you state what you have done in reference to measuring the machinery at the Saxonville mills? State it with deliberation, so that the reporter can take it

down, and in detail.

- A. I was requested in August of this year, to take the dynamometer which I use, and which was built by the Amoskeak Company of Manchester, under the direction of Governor Straw, the calculations afterwards verified by myself, which has been tested with the two dynamometers belonging to the Locks and Canal Company, and found to agree with them. I took this dynamometer, on the 14th of August, to Saxonville, where I measured portions of all the machinery employed, enough to get a pretty accurate average of the power required by each class of the machines, at the following result. This I can either give you in detail of every machine, or each class of machines, or the general summary of the mills.
- Q. I will call your attention to mill No. 1, and the machinery contained in it. What did you find to be the horse-power employed in running that machinery?

A. 239,447 horse-powers.

Q. How much in mill No. 2?

A. 86,154 horse-powers. Total, 325,601.

Mr. Hodges. I will say, that Mr. Webber measured mill No. 1, and it includes the machinery in the L part that extended back, which we saw. I only speak of it in order that you may not be led into confusion hereafter in the examination of the witnesses.

WITNESS. I should also perhaps state, to make the matter perfectly clear, that what I call mill No. 2 includes machinery in two buildings, mill No. 2 and 3, as I believe they call them, but it was machinery driven from the left-hand side of the engine. I call it No. 2, to agree with their own customary mode of reckoning.

Q. (By Mr. Russell.) Does this include all the machinery of

the entire mills?

A. This includes the entire machinery.

Q. Of all the mills?

A. Yes.

Mr. Hodges. He speaks of it as including it all, but there is an exception to which I was about calling his attention. Did you at that time take the measure of any machinery save in mill 1 and 2?

I particularly refer to the basement of mill No. 4.

A. I do not recall any knowledge of any mill No. 4. I took measurements, made an examination of the machinery in a mill which they called No. 2, at the left-hand of the engine, and then of certain gigs and finishing and weaving machinery in a mill back of that.

Mr. Hodges. We shall show by the testimony of Mr. Hill, the superintendent, that there is a little machinery in the basement of

No. 4 which he did not take,—we omitted to point it out to him,—which would increase the amount of power a little. The items of machinery amount to perhaps 25 or 30. I will now examine him as to each of these items, content to stop whenever I have gone as far as the gentlemen desire.

Q. Will you begin now at mill No. 1, the basement.

A. Shall I go on in the exact form in which I examined the separate machines?

Q. If you please. In other words, take your own course, and tell the gentlemen clearly what you did, and what the result was

of your measurements?

A. I commenced in basement of mill No. 1, with a worsted card and comber, a combined machine, 40 inches wide, making 115 revolutions a minute and carding 300 pounds of wool per day, of which I find the power required to be 2.113 horse-power. then measured a narrower card doing the same amount of work, 34 inches wide, and the power required for that machine I found to be 1.732 horse-power. I took next three roving frames, which I took altogether. I found the power required for the three frames to be 1.1 horse-power. That included all the varieties of machinery in the basement. I then went up stairs to the next room, known as the lower spinning-room, where the first machine I tested was a flyer spinning-frame of 128 spindles, the spindles making 3,110 revolutions a minute. The power of that frame I found to be 2.3 horse-powers, which was equivalent to 9.88 foot pounds per spindle. There were in all 36 frames in that room, with 3,744 spindles, the frames varying somewhat in size, so that I reduced it to single spindles, which gave me for the power of the

spinning in that room 67.256 horse-powers.

The next thing which I tested was the five roving, known as "dandy roving" among worsted spinners, usually. That was in the same room — the L of the mill, on the same level. The frame which I tested of 12 spindles required 0.559 of a horse-power. Pro rata, the 168 spindles would require 7.827 horse powers. There were then 50 spindles of second or intermediate roving, which I tested. One frame took 0.439 of a horse-power. The whole would foot up 9.166 horse powers. I then found on that level some machines on which I could not put the dynamometer to measure, on account of the belts coming directly through the floor. There was no opportunity for the insertion of the dynamometer, but they were all machines similar to machines which I had tested in other mills, and of which I had records, and which, therefore, I was obliged to estimate by my previous records, amounting in all, for five spoolers, to one-horse power and a quarter; three twisters, six horse-powers; eight reels, two horse powers. I then went to the upper spinning-room, where there were eleven twisting frames, running 2,600 revolutions per minute to the spindle. I tested one of these frames, getting a result in power of 2.91 horse powers, giving for the eleven, 29.735 horse powers. On the same floor were 17 blanket looms, of which I tested one, taking 0.185 of a horse-power. Not considering that the test of a single loom can be made with positive accuracy, I have reduced my estimate to one-sixth of a horse-power for each loom. I then took a cardroom, where I tested thoroughly a complete system of cards, repeating the tests, finding the first breaker card I took 0.88 of a horse power; the second breaker card 0.775; the third, or finishing card, 0.771; making for the set 2.426 horse-powers. There were five sets in that room which would amount to 12.130 horse powers, and there were five sets more in another room in the mill which were belted up from below, which I could not test, which I estimate at the same powers with those which I had tested.

I came next to the jack spinning, and found eight self-operating jacks, built by Davis & Forber, varying in size. I took an average one of 150 spindles, which gave me 0.976 of a horse-power. The eight, calculated in the same way per spindle, would amount

to 7.746 horse-powers.

The next thing which I tested was a filling-winder in the attic, which took a horse-power and 0.954. There were also three jacks in the attic, which, taken to be of the same power as the one which I tested below, gave 1.952 horse-power. A wool-picker in an annexed picker-house, running 480 revolutions a minute, required seven horse-powers. There are two of those machines. There were also in the same shed, attached to the basement, two rag-pickers, which took a little more power than the wool-picker, being 7.324 horse-powers each. I believe that covers the items of the separate machines tested in the No. 1 mill, a summary of which altogether is, as I have stated 239.447 horse-powers.

Q. Now mill No. 2?

A. In mill No 2, I tested a wool-picker in the attic which varied from the ones which I had tested below, not doing as much work, which took 5 3-4 horse-powers. The remaining machinery in No. 2 I took from the tests in No. 1, where the machines were similar. There were nine sets of cards, eight jacks, and 36 of the same looms, the looms being in the building behind which I suppose was No. 3. I have it No. 2 and No. 3.

Mr. Hodges. It was not No. 3; it was No. 2.

Witness. There were then certain machines in the basement, which I was obliged to take from previous records, which I found it impossible to attach my dynamometer to, and which at the slow speed of the shafting, I could not drive through my dynamometer, without having extra shafting put up for the purpose. I therefore took that machinery, consisting of eight rotary fulling-mills, two hydro-extractors, four rinsers, and six gigs, from previous records made at other woollen mills, as follows:

Rotary fulling-mills, 2 1-2 horse power.

Aydro-extractors, 2 each.

Rinsers, 1 each.

Gigs, 2 each.

There was then a small skein-winder which I estimated, as by a previous test, at a quarter horse-power; and three fancy looms, which I called, also from previous records of many fancy harness looms, at a half horse-power, each making the footing for No. 2 mill 86.154 horse-powers. At the time I was there, this machin-

ery in the two mills was not all running. One set of cards were stopped in No. 1 mill; half a dozen looms were standing, and a proportionate amount of the finishing, fulling-mill, &c., was consequently stopped from that stoppage, amounting, as I calculated, to from 10 to 12 horse-powers. I then verified my observations with the dynamometer by taking the indicator cards from the steam engine of the amount actually running at the time I was there, which footed 314, — 2 horse-powers being driven at that time by the engine.

Mr. Butler. So that your amount here 325.601 would be the

amount, if all the machinery had been running?

A. Yes.

Q. (By Mr. Hodges.) Mr. Webber, in making this estimate of horse-power, did you take into account the power necessary to turn the shafting? You applied your dynamometer directly to the machines. How did you, in doing that, estimate the power necessary to move the shafting, and, in fact, to communicate the force of the engine to each particular machine? and, if you did not,

what, if anything, did you do to compensate for that?

A. I was guided in that by a number of previous experiments, by which I have found that the total amount of the machinery in the mill, footed up by the dynamometer measurement of each machine, is not very far from the actual amount of power required to drive such portion of the machinery as is in daily average operation, with the necessary shafting; that is to say, that there will be about 10 per cent. additional required for the simple shafting, according to a great number of experiments that I have made; and in the ordinary running of the mill there will be about 10 per cent. of the machinery stopped for doffing, stripping, and changing shuttles; so that the actual product of a mill is seldom more than about nine-tenths of what the machinery would do if it was all in Therefore, I think that one about compensates for the operation. other. And I have had two occasions on which I have been able to verify it with very considerable accuracy — one in the case of the Whiddendon Mills at Taunton, where, three or four years since, a water-wheel was put in with the closest possible shave for power. I had made it with 100 horse-power required to drive the machinery alone. The same people wished me to put in a wheel which they tabled at 110. They asked me if I thought it was safe to run so close. I told them that I thought they might do it. They did so, and six months afterwards, when I was at Taunton, I was requested by Mr. Lovering to go down to the wheel-pit with him, and see how beautifully he had his gate-rack — lifted all but one tooth — and the wheel was driving the machinery. The same system was adopted the following year at the mill at Woonsocket, where the power of the machinery footed 223 or 226 (I am not actually sure of my memory as to the last figure). At all events, the wheel put in was agreed to do precisely that amount of work under 13-feet head; and I found that it did it, and just fairly did it - i. e., that of machinery which weighed 226 by dynamometer, if it was all in operation, the portion which was the regular

average running was driven, with its shafting, by the wheel which

was guaranteed to give the same amount of power.

Q. (By Gen. BUTLER.) That is, if I understand the average amount of machinery that will be stopped, in the necessary working of the mill, will be about equal to the amount of power required to carry the shafting?

A. That is the result of my experience.

Q. (By Mr. Hodges.) And you, in that judgment, are referring to mills of the varied machinery that is found in those like this, where there is at once carding, spinning, and weaving and their various appliances?

A. Entirely; where every kind of machinery used in the manu-

facture of cloth is in operation.

Q. Now, did you at this time make an examination of the means of using water, and did you examine the wheels? If so, first state as to the water-wheels that are there, and then proceed with whatever you have to say concerning the water-power, etc.

- A. I will state that I was unable to examine the wheels. They were submerged, and I could not get at them. I examined the dam, water-ways, flumes, etc., all of which I found to be of very thorough and admirable construction. But the wheels were not to be seen without rigging up a steam pump, and pumping the dam.
- Q. Whatever memoranda you took of the wheels was from information given at the mills?

A. Information given me by Mr. Hill, the machinist.

Q. Now as to the dam — the flumes first, and then I shall come to the wheels afterwards. Will you state what the cost of constructing such a dam as that is, in your judgment, if you are familiar with that subject?

A. I hardly think I could give the statement at present. I should require more accurate measures of the width and height of

the dam than I now have.

Q. Are you not sufficiently familiar with it to give a general

judgment upon it?

- A. I should prefer not to. It is a matter that could be calculated if I had the measurements.
 - Q. What of the flume?

A. As I said, I found that the whole work appeared to me to be of the best construction.

Q. Is it a matter that would require from year to year any substantial expense for repairs, or take care of itself?

A. Very slight indeed. Everything seemed to be very thor-

oughly done.

Q. Now, sir, could you estimate the cost of the flume, the medium of conducting the water to the wheel-pits?

A. No, I could not.

Q. Did you sufficiently examine the wheel-pits to be able to give the commissioners the cost of those wheels and of the putting them in, if I were to give you the dimensions?

A. No, sir. It would be impossible for me to give any accu-

rate estimates without a further examination, and in a different direction from the one that I have made.

Q. When you have spoken of indicator-cards of the engine showing 314 horse-power, you meant to convey the idea that they show the use of 314 horse-power constantly?

A. It was being actually used at the day on which I took the cards, with (as I before stated) what I estimated to be 10 to 12

horse-power stopped.

Q. Perhaps we shall get some light by looking at this from another direction, Mr. Webber. What is the estimated horse-power required, per set, for, we will say, a set of flannel machinery?

A. It is usually considered to be somewhere from 6 to 7 horse-power for a set of cards on flannel work, for all the machinery.

Q. (By Gen. BUTLER.) The necessary machinery to use up the product of such cards is what you mean?

A. Yes, sir.

Q. (By Hodges.) Does that include the machinery as now speeded, at the speed at which it is usually run, and does it include taking the wool at the scouring, and again the scouring of the flannel, with all the processes between?

A. I think it would cover the power required for making light

flannels.

Q. Suppose you take heavy work, like that blanket work which

they were doing Saxonville?

A. The power would then be set at not more than 9 horse-power for a set of cards possibly worth ten, the hydro-extractors, fullers, and gigs requiring a good deal of power, and additional to that required for the simple scouring in a flannel mill.

Q. Did you take a measurement of the fall there?

A. The water not being in operation I could not get what the real working-head was. There was an apparent fall of over 24 feet, which would be diminished of course in actual operation. Not having the levels, it would amount to nothing as it stood there.

Cross-Examination.

Q. (By Mr. Butler.) Everything was running by steam, you say, Mr. Webber?

A. It was when I was there.

Q. You were asked, I suppose, to take all the machinery, were you not?

A. Yes, sir.

Q. You supposed that you did?

A. Yes, sir.

Q. If there was any omitted, it was omitted by accident?

A. Yes, sir; it was omitted by accident. I thought I got everything.

· Q. Was the superintendent of the work with you, showing you about?

A. He was with me a greater part of the time.

Q. (By Mr. Hodges.) Name the person who was with you.

A. Mr. Hill was with me. He showed me all the different machines, as I understood. He showed me all.

Q. (By Mr. Butler.) Did you observe what the engine could do, run properly and well - whether it would make any more

power than this?

A. It was running very easily indeed, and freely, with this 314 horse-power. I have no doubt it could be forced up, if necessary, to 350. It was running very quietly and steady at that, and running with remarkable uniformity in some respects, that is to say, the engineer who was running it seemed to be a very skillful, practical man, and had it so well balanced that while one summary gave 140.56, the other gave 140.79.

Q. Was it well worked? Was it working easily?

A. Yes, sir.

Q. I suppose your experience is like that of others, that where a steam engine is running, and not brought up to its capacity, there is no expense in making 10, 20, 30, 40 or 50 extra horsepower?

A. Within a reasonable limit.

Q. Except the coal, waste, and oil? Is that all?

A. Yes, sir.

WILLIAM H. CARTER, sworn.

Q. (By Mr. Hodges.) Where do you reside?

A. In Lowell.

Q. What is your occupation?

A. Manufacturing.

Q. Do you know the Saxonville Mills?

A. Yes, sir.

· Q. How long have you known that property? A. Well, since 1844.

Q. Have you ever been employed in that mill?

- A. Yes, sir. I was employed there in various capacities from 1844 to 1864, being away during that time about two years — between 1854 and 1856.
- Q. So that substantially you were acquainted with that property from 1844 to 1864?

- A. Yes, sir.
 Q. What were you first employed in there—beginning with
- A. I was employed during the winter of 1844 as a spinner in No. 2 mill.
- Q. At that time describe the different mills, i.e., state what mills there were there?
- A. There was No. 1, substantially as it now is, and No. 2 and No. 3. There were some other out-buildings, of course — storehouses.
- Q. I have reference simply to the mills those in which the operating machinery was employed. In what were they engaged at that time?

A. The manufacture of worsteds, blankets, and some other cloth — coarse goods.

Mr. Hodges. Substantially the same work that they are doing

now.

Q. (By Mr. Butler.) Have you been there lately?

A. I have been there frequently since I left.

Q. (By Mr. Hodges.) You refer, of course, simply to the machinery that is employed. Now, sir, beginning with 1844, when you first knew it, what was the power employed there when you first went there?

A. What do you refer to? Do you mean to ask whether it was

water-power or steam-power.

- Q. Yes, sir. And if water-power, how it was communicated to the machinery, how it was employed, what kind of wheels, &c.?
- A. Well it was substantially water-power. It was employed in each of the three mills by breast wheels a wheel in each mill.

Q. Was there a steam-engine there at that time?

- A. Well I think that the engine in No. 1 was put in about that time that I first went there.
- Q. Do you remember the time of the year that you went there?

A. Yes, sir.

Q. What time was it?

A. In October.

Q. Well, had that engine then been running?

A. I could not tell you certainly about that; but I know I heard the engine spoken of as a new engine then, and as being in. Whether it had run any or not, I could not say.

Q. When were the turbine wheels put in?

A. Well, the first turbine wheel was put in in No. 1—the Boyden turbine wheel—I think it was in 1846. Not recollecting what I was doing at that time, I have no dates by which I could fix it; but it was about that time.

Q. Had you anything to do with putting it in?

A. Yes, sir, I was connected with putting it in — working in the yard. I had charge of some of the work connected with the repairing of the wheel-pit — and that work.

Q. Can you give the dimensions of that wheel?

A. No, sir.

Q. We will show it in another way. When was the next turbine wheel put in, and where?

A. The year when the next one was put into No. 2 I could not tell, but I think it was during the two years that I was away.

Q. As we are upon turbine wheels, I will ask when was the

third put in, and where?

- A. Well, the third was put in in 1860, I think. I put the third in myself in No. 3.
- Q. If you ever acted as general superintendent of the mill, please state when and how long.

A. From 1856 to 1864,—or eight years.

Q. Well, now, sir, going back, during the time you were there, all the time, superintendent or otherwise, were you aware of there

being kept any record of the time when the steam-engine ran, and when the mills were run entirely by water?

A. I think not, sir. We never kept any record of that kind.

Q. As superintendent of the mill, you of course knew about the running by water, and of the running by steam. As an operative in the mill, you had greater or less occasion to observe it. Will you state, from the time when you first knew that mill until you left it in 1864, and from what you have known since, what portion of time in the year (take the average of years together) the mills were run, all of them, by water?

A. Well, there would be some variations in years. Some years we run very little by steam. In other years that were peculiarly dry, we run more; and I should think, as far as I could judge, that certainly the mills would all average, to run by water, from

eight and a half to nine months in the year.

Q. What do you mean when you say from eight to nine months, all of them,—do you mean running night and day, or running all day—the day being ten or eleven hours, perhaps?

A. I mean running in the daytime.

Q. Well, now, supposing that you say that the mills, all of them, ran eight and a half to nine months in the year by water, state what, if anything, could be run the remainder of the year.

Mr. Butler. Do you mean "was run," or "could be run"?

Q. (By Mr. Hodges.) I mean "was run." Remember, all the time, that for the present we are speaking only of the days' works,—running in the daytime and not in the night.

A. Please ask your question again.

Q. Supposing that you have carried all the mills along eight and a half or nine months by water. There remains, then, three or three and a half months of the year in which we have not spoken of water. Now, were any of the mills running clear through by water?

A. I have taken in, in making my estimate, that idea, as far as I can. Some years we ran one of the mills clear through. No. 3 always ran by water. It was not intended to have steam-power there at all; and No. 2 often ran during the entire year by water without making any steam connection; but we never could run all the machinery. At other times we had to make steam connection in Nos. 1 and 2; but never expecting to use steam, unless in an exceptionally dry time, towards June, and always expecting to get water to run the machinery from the last of September to October. During that time we changed and put No. 1 into steam. When it was getting low, and we had almost enough, we would change No. 2 into steam. But if we found that the water was going down rapidly, we changed No. 1 into steam; and then we put the other mill on, — even changing once in a week, back and forth. If we had a rain like the one of last night, we should give the superintendent orders to put on water this morning. It was a steam that came up very quick and went down very quick, and we were changing back and forth during those few months all the time. I should expect that if an accurate record had been kept, it would show that we ran by water perhaps eight and a half or nine months

on an average, — some years very much more; others probably it would be less. I know when we were running through the war, there was one season (in 1863, I think) that we scarcely ran anything by steam at all, while running nights and days all the machinery; but I think that was an exceptionally wet year.

Q. (By Mr. Butler.) It was exceptionally wet?

A. Yes, sir.

Mr. Hodges. The tables show that it was exceptionally wet

during the time that he means.

The Witness. Yes, sir, we very seldom did it, and it was only in the winter, and after we commenced in October; except that it might be when the little rivulets and streams were suddenly filled up, and then they would be dry again, and we would be short of water in a few days.

Q. No. 3 you never ran by steam?

A. We never did,—only in case of repairs, as the shafting was put across. At the time that we were running night and day in the war, and we were contracted up to all we could produce, and No. 3 mill prepared all the wool for the others, and it was necessary that we should be provided against any stoppage in any contingency, then we connected the shaft with No. 2, and during that connection we connected the new wheel there and ran that by steam or water, just as we had necessity, during that time. That was for five or six weeks. That was during the war.

Q. Down to that time there was no means of running No. 3 on

steam?

A. No, sir; we never had any occasion. We always had plenty of water, or very seldom failed of it. It was an extremely dry season that we did not have more than water enough to run No. 3. We never felt any concern about that at all.

Q. So the connection was made in order to avoid contingencies, when water was required in the water department,—No. 3 being

the preparing mill for all these? Is that so?

A. Yes, sir.

Q. Do you recollect what year that was?

A. I could not tell you what year it was. It must have been

in the early years of the war - the commencement.

Q. Well, now, considering what you know of the stream there, will you state to the commissioners your judgment of this condition of things? Leaving the work by day, as you have stated it, will you state what work could be depended upon to be done by that stream at night. (And Gen. Butler in this case, I mean "could be," and not "was."

Mr. Butler. Well, I doubt somewhat whether there is any purpose in that. I doubt very much whether anybody is an expert as to what can be done by running nights as compared with running by day, because I doubt whether there is sufficient work done in the night as a rule to make a series of observations from. In 1862 you could do all there was to be done with water-power, but that was an exceptional year. You are putting in a judgment from the exception. All the experience he had was not experience

under the rule but under the exception, because the rule was, not to run by night. Very few people run by night.

Mr. Hodges. That might touch the value of the testimony.

Mr. Butler. It touches the qualification of the expert — his opportunity to make the test. It would be like this: a man has seen in an exceptional time a certain thing done, and he is asked to judge from that what could be done as a rule.

Mr. Hopges. We claim that we are entitled to recover the value of that power taken away from us. That value is to be ascertained by ascertaining what it can do. We ascertain what it can do by seeing what it has done. Now this witness was an observer of that water for twenty or thirty years, - so much of an observer, that he directed its use. We, therefore, suppose that his testimony is as good on that subject as anybodys can be, and with a view to ascertaining just what the water can do, I submit

that we are entitled to the testimony.

Mr. Butler. My objection is that this is wholly a practical We are not to pay for what possibly might be done, provided everything else would permit that it should be done. But here is a mill, so far as we have got its history, that from 1844 to 1876, in an exceptionally wet season, in an exceptional war time, was able to run one year by night, because it had a contract which required it. Now, then, is that an element of damage? Is it not remote for Mr. Simpson to claim that the city should pay him for the use of this water by night, which in thirty-two years had only been used by night one year, and that because of a great war calling for so many blankets? Is not that remote? In other words, should it not be the ordinary use that manufacturers make of power? If you give full value to this testimony you double the damages, because men could work all night. But that requires gaslight; that requires a double set of hands; that requires extra pay for the night time; and experience does not justify that. You can work but ten hours in any twenty-four now; you can work but sixty hours a week with the same set of hands. Does it not all come into the region of remoteness? That is an objection to the testimony. It is, provided the witness had such means of observation as would make him competent. Then we add to that, in having this question put, the other element of the motive, to wit: That this witness only in an exceptional year (it might be a provision of nature to furnish us with blankets during the war), only in an exceptionally wet year, knows that they ran that way, that they could run in the night.

Mr. Hodges. He said "one or two years."

Mr. BUTLER. That gave him a little more observation.

Mr. Hodges. The three or four years were not exceptional as to the flow of water.

Mr. Butler. I believe they were quite exceptional. One is admitted to be, and the other is not. The rain tables will show. At any rate, it set us into a series of inquiries. I think that the community would not feel themselves justified in giving damages for the possibility of work by night, unless the business which was done at the time and at the place required for its profitable carrying

on the state of working by night. Now, there are some mills that require to be worked by night, such as paper-mills; to make profitable business, a paper mill requires to be run night and day. That is the way the judgment of mankind and its skill in the arts have found it necessary to use the water, prudently and skillfully, except in exceptional times, when driven by a contract which requires for its fulfilment every possible exertion. The ordinary judgment of mankind have not yet found it convenient to work by night. They have not found it profitable to work by night. And in the present state of the country working by day has now made, in the view of many people, such an over-production of goods that they cannot be sold. And, if all our mills are going to start and run by night, and the City of Boston expected to pay for the power of the working by night of all our mills, I think a wrong would be done. And why I am a little anxious in insisting upon this view of the question is, that this is a claim not set up by the people, nor by the astute gentlemen who represent the Essex Company, because they have told us that they have to store by night in order to use by day. But it is an experience and judgment well known, that the rule is that there is no working by night. Men have not found it, in the usual course of their business, either convenient or profitable to work by night. And my belief is, that if the mills of the country should undertake to run in the night time their apparatus regularly for a long series of years, that a sanitary legislature would interfere. I should as a legislator of course; because I think there is more necessity of having a healthy population than there is for over-production of cloth, when steam comes so near water for the cost of its production to every one. You have got to pay for twenty-four hours' use of all the water from the Dwight Mills. If you insist upon forcing it by night as well as by day down to the Essex Company, they would double their already inflated damages.

Mr. Hodges. Do not all these objections apply to the degree of damage? If we have to pay extra for men to run by night, then that is worth so much less for horse-power, but that does not

make it worth less.

Likewise, the use of mills by night, is, in many cases, necessary to the mills, in time when great production is required; when the public exigency comes in and demands a supply. In paper-mills, and in certain iron-mills, it is true that there must be work by night as well as by day. Now all of that touches the degree of damage. We are inquiring what property the city of Boston has taken from us. And while all of us may consider it that the damages against the city of Boston are swollen to very large sums, yet those are things that the city of Boston should have taken into consideration when she took the property. She did not inquire of us what we would ask for the property, or go into an investigation then, but she took it.

As to the capabilities of this witness to speak, we have got to prove these allegations by men that are fallible. But we believe that no man knows more about this subject than this witness, or can know more about it, unless it should have been by a series of

expensive experiments. Therefore, we tender this witness to say

what the power could be by night. What its value was.

Mr. Butler. I suppose I have the close, and I will therefore call another consideration to your minds, and that is this: Would not the value then be a sum which would ensure a Government contract which was performed by it once in thirty years. Is not that the amount you ask?

Commissioner Russell. We think it is competent to prove that the stream is one that will run all day and all night, and not one that requires storage all the night, to save water for the day, because we think a stream is more valuable that will run all day and all night, even if it were to be used only in case of exigency. It is worth more that it is capable of being used in case of exigency.

I suppose there are mills now profitably running more than the hours prescribed by the statute, and mills that employ more than one set of hands. And that is liable to be the case at times in any species of manufacture; and we suppose a stream to be worth more that is capable of being so used, than one that is not. It by no means follows that it is worth double, or that it is worth any specific percentage more than if it would run only during the hours of ordinary labor.

Mr. Butler. Then, would not the question be as to the ca-

pacity of the witness.

Commissioner Russell. I understand that to be the question to which this inquiry is directed — as to the competency of this witness. It is a farther objection, it would seem, that the witness' knowledge of this stream, and of the work done by the mills, is better knowledge than the commissioner can possibly have, and that he is therefore competent to testify upon that point.

Mr. BUTLER. I wish your Honor would report this question. We take exception to the evidence, and shall struggle against the

report if it shall be against us.

Q. Well, Mr. Carter, I will repeat the question as near as I can: Will you state what length of time, if any, the mills at Saxonville could be run by night as well as by day in the average years backward over the period of your acquaintance, supposing them to run by day by water only; how much will they run by night?

A. As we never kept any gauge, I have no other means of coming at that, except the experience I had during the three years in which we ran night and day; and one of those years, perhaps, was more wet in the summer than usual. But I should say we could run that whole machinery nights, in addition to running it all by water days, at least five to six months. I should say five months would be perfectly safe at least, as almost always water was running over the dam largely in the morning, when we were running entirely by water during the day, and it could have been used during the night just as well. And if it had been kept back, why of course we could have used more machinery in the day-time to draw it down and save it, if we only ran in the day.

Q. Taking the fact that you could run the whole machinery by night, having already run it by day for five months in the year,

could you run any of it in any other months in the year beyond the

five months, and, if any, what?

A. Yes, sir; we could run, probably, one of the mills part of the other months. I should say we could have run half of the machinery at least two months more.

Q. Couldn't you run the big mill two months more?

A. Possibly. That is a matter, of course, that it is impossible to tell exactly about; but, judging from the natural running of the mills, I should think it would be somewhere in that vicinity.

Q. Well, then, could not you run the smaller mill or mills some

of the time in the night?

A. Well, the natural course would be, that as we failed to have water to run the larger mill nights, we should put that on, with the knowledge that we took the other off, and run by water as much as we could on No. 2. mill. Perhaps we might run that in addition possibly a month or two. I know, on talking the matter over the time that we ran nights, we seemed to think that we ran just about as much and for as long a time, as if we did not run nights. When we did not use the water, it ran over and was wasted. The storage capacity was not very large. When it did not run over in the night, we felt that we had got to change into steam in a very short time, — in a day or two.

Q. How long could you run on the water that you could store?

Mr. Butler. That is to say, suppose the supply had been cut off.

Mr. Hodges. I meant, particularly, that suppose you have run the water down as low as would run the machinery. Then you shut down the gates and held the water back until it ran over the dam, and then apply it.

Q. Then how long would what you kept back run the mills?

A. If I understand the question, it is, that suppose the supply is entirely cut off, and the ponds were all full, how long could that run the mill?

Q. Yes, sir.

- A. Well, the storage capacity was not large. The dam at the grist-mill probably held the flowage over which we flowed there, would hold three times as much water as the dam below. Taking the dam below, between the mill and the grist-mill, I don't think we could run our mills over half a day, with the storagewater between the two dams.
- Q. Could you, with the storage of both the dams, run for a day?

A. Yes, sir, we could. I should say, if we had not any water, we could run more than a day with the storage of the two dams.

Q. Well, now, turn your attention to another subject. Can you give us the cost of constructing that dam, — for the wheel-pits and everything?

A. I could not. No, sir.

Q. Can you give us the dimensions of the wheel?

A. I could not.

Q. You don't recall the dimensions of the one put in while you were there?

A. I think the wheel put in while I was there in No. 3, was 5 or 51 feet, worn well.

Mr. Butler. We have it at 5.

Mr. Hodges. Yes, sir. [After consulting notes.] The Warren wheel is in No. 2, but the Boyden wheel in No. 1; and then there is a smaller wheel for the shop.

Mr. Butler. The Warren wheels are in 2 and 5, and then there

is a small wheel for the shop.

- Q. Are you sufficiently familiar with the costs of water mechanism to tell us the expense of a Boyden wheel seven feet in diameter?
- A. I could not tell, sir. It depends a great deal upon what expense is laid out on flumes, and preparation and putting in whether it is a wooden-flume or an iron-flume. Persons who have had that experience, and gone through with that, might tell you. I could not tell you. No, sir.

Cross-Examination.

Q. (By Mr. Butler.) During the five months when you think the water could have been used night and day, you would still have a surplus would you not?

A. Yes, sir. It would run over the dam a good deal then when

we were running.

Q. Did you drive all your machinery during those years of which you have spoken, — when you ran night and day, — to its utmost capacity?

A. All the blanket machinery was driven.

Q. That was the large bulk I suppose — the bulk of your machinery there at that time?

A. Yes, sir; taking the finishing department and all the machinery connected.

Direct Examination resumed.

Mr. Hodges. I have forgotten one branch of my inquiry, and perhaps I had better take it up now, — with the consent of the gentleman on the other side.

Mr. Butler. Yes, sir.

Q. (By Mr. Hodges.) What is the relative amount of machinery in the mills, as they were run in 1864, when you left, and as they had been then running, for some three years we will say, with that in the mills in 1844, — in view of the amount of power required for running?

A. Well, do you mean to ask whether there was more machinery in 1864 than there was in 1844, or whether there is more now

than in 1864?

- Q. I mean whether there was more in 1864 than in 1844, i. e., whether it required more power?
 - A. I think it did in 1864.

Q. How much more?

A. Well, I should judge from 25 to 40 horse-power.

Q. Then turning from 1864 to the present time, what is the rela-

tive amount of power required?

- A. Well, there is not very much difference. One mill now is not running No. 3 which, I think, required some 50 horse-power. No. 3 mill, which was running in 1864, has been burned down, and never rebuilt. It required some 50 horse-power to that machinery, and most of it has been put into the other mills, and there has been some addition of machinery in the other mills since 1864; and taking the whole machinery that was run in 1864, and now, I should say that it might require from 20 to 25 horse-power more now than it did in 1864 to run the machinery not more than that, and perhaps not anything. Of course there was some of the machinery that was in No. 3 that has never been replaced one burnicker, certainly, and two rag-pickers. But then there has been some machinery put in I think one or two spinning-frames and some twisters, and a bobbin-winder some small matters that were not in at the time I left there.
- Q. So the power would not be materially changed, if anything.

 A. I should say that it took a little more power now than it did
 then to drive.

Q. Has the dam been raised since 1864?

A. Yes, sir.

Q. Do you know when it was raised?

A. Well, I could not tell you; but it is since I left there. Just the year I don't know. I know it has been raised.

Q. Do you know how much?

A. Well, I have been told that it was four feet. Upon looking at it, it seems to be about that.

Q. Would the four feet of dam, thus raised, give a power equal

to carrying the increased machinery, or more than that?

A. Well, I should think it would—a good deal more; though engineers would know better about that, judging from the proportion of power.

Mr. Hodges. That was the subject I had omitted to examine him upon. I will now hand the witness over to you, Gen. Butler.

Cross-Examination resumed.

Q. (By Mr. Butler). When was the grist-mill dam given up?

A. I think at the time that the dam was raised.

Q. How high did the grist-mill flow? What was the head of water raised by the grist-mill?

A. I think about six or seven feet that we had of fall there.

Q. Then, when the grist-mill dam was given up, you should have the storage capacity of that dam lost, except as it was supplied by the raising of the dam below.

A. Well, that dam, I think, has never been given up. Q. It never has been used as a reservoir — has it?

A. Yes, sir; it is used the same now as a reservoir that it has been.

Mr. Hodges. We use that grist mill-dam just the same as

always, only that we have set back the water four feet. lowered its fall, but not changed the height of it.

Q. There was a saw-mill where the grist-mill was?

A. There was a saw-mill and a grist-mill both.

Q. Owned by the Saxonville Company?

A. Yes, sir.

Q. Then at one time the use of them was given up - when they burned down.

A. They burned down and were never rebuilt.

Q. You think that upon the whole the capacity of the works, so far as requiring power, was about the same before as it is now, or perhaps a little increased.

A. The only change that there has been is the raising of that

dam.

Q. I mean capacity of the works for using up power.

- A. Yes, sir, I should say that the capacity of the works for using up power had been rather increased than diminished on No. 2.
- Q. The raising of the dam would only increase the power according to the increased storage capacity, of course?

A. Yes, sir; and extra fall.

Q. It gave extra fall, giving a more economical use of the water.

A. Yes, sir.

Q. Not increasing the amount of the water, except in storage capacity. How did you heat the mills in those days?

A. By steam.

Q. Was that steam furnished from the boiler directily, for heating, or was it furnished by the exhaust of the engine, after the steam had passed through the engine?

A. It was furnished direct from the boiler.

- Q. With No. 3 mill, the amount of heating space would be a little increased from what it is now, — the space necessary to be heated?
- A. Well, with the additions that they have made in the mills, the amount of heat necessary to warm up the buildings would be more now than it was then.

Q. How much more?

A. Well, I should say that it would be increased 25 per cent.

Q. Taking out No. 3?

- A. Yes, sir, 20 to 25 per cent., and including No. 4 and another mill which has been built since, and which is heated.
- Q. Then we have 20 to 25 per cent. more steam required for heating?

A. I should think so, sir.
Q. Now, then, I suppose there was a record kept of the amount

of coal consumed; was there not?

- A. Well, not daily, only the amount that we consumed during the year. We knew what we bought, at least I suppose so. The coal was always bought and paid for by the treasurer in Boston, and we did not have the account of it at the mill.
 - Q. Somebody knows how much coal was there?

A. Yes, sir, I suppose so.

Q. And I suppose it is easy enough to ascertain how much coal it would require economically to run that engine a day?

A. Yes, sir.

Q. Now then, assuming the quantity of coal required to heat the buildings now to be 20 or 25 per cent. more than then. If we could get at to-day the amount that the engine uses to make a horse-power, you could tell how many horse-power you made by steam, could you not?

A. I suppose so; yes, sir.

Q. Then it is in the power of the company, if they will, to give us those exact data, instead of giving us your recollection for 20 years, is it not?

A. Well, I should not want to say whether it was or not.

Q. Well, from your knowledge of the state of business, must it not be so?

- A. I suppose they know what coal they used and paid for; but how much went for heating, and how much for running the engine, it would be rather difficult to tell, because we were using the same before.
- Q. But pardon me; if they did not keep an account of how much was for heating and how much was for power, then they could not tell; but assuming that the 25 per cent. more was for heating now than then only, and finding out how much coal they use in the whole now, and how much is used now for running the engine, it would not be very difficult, would it, to tell how much they used before running the engine?

A. No, I should suppose not.

Q. I wish you would give us those data.

Mr. Hodges. You shall have all that we have got. But I am afraid there was a little coal used about some of our books that will prevent our doing it. I think our books upon this subject were burned in the fire.

Mr. Butler. While that fire was very unfortunate in some matters and fortunate in others, the freight books of the road would tell how much they delivered,

Mr. Hodges. Those will be at your service if you will get

them. You shall have all we have got.

Q. Do you think anything more than the steady run of No. 3 mill, (which you think was about 50 horse-power,) could be depended upon during the three dry months.

A. Yes, sir. I should think they could. It was in an extreme dry season that we did not have more than water enough to run

No. 3.

Q. I suppose you knew something about how much water has

been running.

- A. This has been a dry season, and I should suppose the record would show that there has been more than 50 horse-power, judging from what I know of the mill—for ten hours; because we never were short in No. 3, and ran No. 2 a good deal of the time.
- Q. Do you think it could be depended upon for more than 8 to 12 horse-power steadily, in the dry seasons, above No. 3?

A. Well I should think it could.

Q. How much would you set it, sir?

A. Well I should think there was scarce any time in the year there but what they could run very near a 100 horse-power, during the three months.

Q. All of the time?

A. Yes, sir. There might be some months that we could not run 100 horse-power; but other years we could run a good deal more.

Q. Now I suppose, as you have told us, when you had an exceptionally wet time in the sumner, you had power running to

waste, - ever when you were using all that you wanted.

A. Yes, sir, very often. If we had very heavy rains, water was running over the dams all the day when all our mills were running; running over at night, and running over in the middle of the day; and of course all we used through the wheels through the day, during the night, would be extra, and running over.

Q. (By Mr. Abbott.) I want to get from your No. 3, while you worked there, about how many horse-power you used, I mean that you had all the time during the dry season. That was the

mill you used entirely by water-power, as I understand it.

A. We had in that mill I think about 50 horse-power and machinery, and then we used a wrench box for scouring wool, which I think we connected with a six inch pipe.

Q. How much horse-power would that be?

A. I don't know that I could tell you; but under a head it could be easily ascertained I suppose. Our head was about twenty-two feet.

Q. A six-inch pipe under a twenty-two feet head?

A. Yes, sir.

Q. Anything else?

A. I don't think of anything else. We always of course used

all the water we wanted for rinsing our blankets.

Q. Taking all your water, you made an estimate that would be an approximate estimate of what you had at the dryest times in running Mill No. 3, and using all the water?

4. I should think we were always using in the vicinity of 75

horse-power.

Q. And were running during that time you were there, through

all the dry seasons?

A. Yes, sir, that would include the dryest seasons. We were very seldom reduced as low as that.

Mr. Abbott. That is all the question I wanted to put.

Mr. Butler. Hereafter when you want to put in any question, I wish you would do it in the examination in chief, before I cross-examine. I don't think I care to ask Mr. Carter any further questions.

Recess till 11 o'clock, P. M.

AFTERNOON SESSION.

EMERY HILL, sworn.

Q. (By Mr. Hodge.) Mr. Hill, what is your name?

A. Emery Hill.
Q. What is your residence?

A. Saxonville.

Q. And occupation?

 \mathring{A} . Machinist. Q. What is your duty in the Saxonville mills?

A. I have charge of the machinery throughout the mills.

Q. How long have you been there?

A. I have been there since — I could not tell you what date it was, but it was the Saturday after the 4th of July, 1843, I came from Manchester.

Q. Have you been there ever since, or, if not, what vacations

have you had?

A. Well, I have had one of seven or eight months, and another one from, I think, about January to October.

Q. Other than that you have been there the whole time?

A. Yes, sir.

Q. Have you heard the testimony of Mr. Carter concerning the putting in of engines and the water-wheels in the mill?

A. Yes, sir.

Q. Do you sustain it, or would you correct it in any way? I allude to the times when the engines were put in and when the water-wheels were put in.

Mr. Butler. I object. Ask him when they were put in.

Q. (By Mr. Hodges.) When you came there, what was the power the mill was run by?

A. Water. Q. How brought into action — by what wheels?

A. By three breast-wheels, one in each mill, No. 1, No. 2, and No. 3.

Q. When was an engine put in there?
A. Well, sir, I could not tell you exactly, but I think it was put in there — well, it was soon after I came there; I think it was put in about 1844.

Q. About 1844?

A. I think so.

Q. Have you any recollection of the state of the water preceding

that engine being put in?

A. Well, sir, I know that we stopped; I don't recollect whether all or part, but I think it was No. 1 mill we stopped that season. I came from Manchester nearly a fortnight before.

Q. Relatively to times since then, was that a dry season?

A. Yes, sir; a dry season. I think the next season we didn't stop at all.

Q. And after that, the following season, the engine was put in?

A. Yes, sir; I think so.

Q. When were the turbine wheels put in?

A. Well, that is what I could not say distinctly, but I should say in the neighborhood of 1847 or 1848, somewheres along there;

I could not distinctly assert.

Q. Relatively to the present time, what power would the machinery of the mill require during the war; or, stated in another form, what power would the machinery you used during the war require relatively to that required by the machinery now in use? Do you need more power now than you did then?

1. Yes, sir; we do. I should judge, well, perhaps 50 horse-

power.

Q. 50 horse-power now more than you required during the war?

A. I should say so.

Q. By reason of introducing new machinery?

A. Yes, sir.

Q. Or speeding old machinery, or both?

A. Well, both. We speeded up all round, and added new. Q. Can you recall when the dam was increased in height?

A. I could not.

Q. Was it since the war?

A. Yes, sir.

Q. Since the burning of the old grist-mill?

A. No, sir; I think it was before. It seems to me it was; I will not be certain about it.

Q. Since the burning of mill No. 3?

A. Yes, sir.

Q. And after Mr. Carter left?

A. Yes, sir; after Mr. Carter left.

Q. Reverting to the machinery, did you aid Mr. Webber—direct him to the machinery to be measured?

A. I did.

Q. He was there, and you have heard his testimony this morning?

A. Yes, sir.

Q. Now I want to call your attention, while in that connection, to some machinery which I supposed to exist in the basement of No. 4. Did Mr. Webber take the measure of that machinery?

A. I don't think that he did. I think I went down below with him and showed him what there was, but I don't think he took that.

Q. What does it consist of?

A. It consists of two worsted-washing machines, two extractors, a pump and wool-washing machine,—a large one, Sargent's.

Q. Mr. Hill, in the time you have been there, will you say how much of the year, upon an average, you have an your mills by water, so far as day-work is concerned?

A. Well, I can say between eight and nine months.

Q. After that, after the eight or nine months, how much of the time, if any, have you run the lesser mills, one or more of them, No. 2 and No. 3.

A. Well, No. 3 was generally run all the time, and the machineshop, as a general thing; that is 15-horse.

Q. 15 horse-power for the machine shop?

A. Yes, sir.

Q. Well, how much of the time, if any, after the nine or eight and a half months, did you run mill No. 2?

A. Well, I could not say exactly, of course. It would depend

upon whether it was wet or dry.

Q. That we all understand. But I now refer to the thirty odd years you have been there, to get the best of your judgment?

A. Well, as a general thing, we put on No. 2 and No. 3 to run

most of the time.

- Q. No. 3, as I understand, wasn't connected with any steamengine until Mr. Carter's time?
- A. Not till we put in No. 3 wheel. That is, we put in the turbine wheel and took out the old breast.

Q. (By Mr. Butler.) When was that?

A. Well, it is since Mr. Carter left. I don't know that I can tell you exactly.

Q. (By Mr. Hodges.) Since Mr. Carter left?

A. No, it was when Mr. Carter was there; it was during the war. It might have been 1862, - somewheres along there, - I could not tell you exactly when it was.

Q. Can you give the dimensions of these wheels?

- A. I think No. 3 is a five-foot wheel, twelve-inch depth of bucket.
 - Q. (By Mr. Butler.) No. 3? A. No. 3; yes, sir; I think it is.

Q. The one not in use now?

A. Yes, sir.

Q. (By Mr. Hodges.) It is not in use now?

A. No, sir.

Q. (By Commissioner Russell.) Whose make?

A. Warren's.

Q. (By Mr. Hodges.) Can you give the dimensions of No. 2?

- A. No. 2 is, I think, five and one-half foot, twelve-inch depth of bucket.
 - Q. (By Commissioner Russell.) Whose wheel?

A. Warren's.

Q. (By Mr. Hodges.) Centre-bent?

A. Yes, sir. Q. No. 1?

A. No. 1 is Boyden's; that is seven feet in diameter, and I think it is nine or twelve; I will not be certain which.

Q. (By Mr. Butler.) You have but one Boyden wheel, have you?

A. Yes, sir; only one. Q. (By Commissioner Russell.) Nine or twelve inch depth of bucket?

A. Yes, sir.

Q. (By Mr. Hodges.) Turning, then, again to the time when

you can use the power, tell us what length of time you can use the mills, and the different mills, at night, having used them in the day, in the average of years?

A. That is to say, spring and fall?

Q. I mean all the year.

A. I understand what you mean.

Q. The average of what you could run?

A. Well, perhaps five or six months, — in the neighborhood of that, perhaps; I could not say. I don't know as we ever tried it except during the war, and then we run the blanket works; the worsted was stopped.

Q. Having run all your works in the day, and all your works at night five or six months, then suppose you took off mill No. 2,

how long additional night-work could you give to No. 1?

A. How is that?

Q. Having run all your machinery at night five or six months, as you have said you probably might do, then suppose you stopped running No. 2 at night, how much longer could you run No. 1?

Mr. Butler. Night and day you mean?

Mr. Hodges. Yes, sir. All the machinery having been run all day?

A. That I could not tell you.

Q. You can give some judgment?Mr. BUTLER. Would not "guess" be a better phrase?

Mr. Hodges. No, I think not. It is a good phrase in certain places.

A. Well, perhaps six weeks or two months.

Q. In the meantime, how about No. 3, when that was in existence?

A. Well, that run all the time by water.

Q. Precisely; and I mean — we are now talking of night-work — could you run No. 3 all along on night work?

A. Yes, sir.

Q. Mr. Hill, do you know the cost of those wheels?

A. I think No. 3 wheel cost \$1,500; that is, the wheel itself and the jack and pulley, the regulator that constitutes the wheel part.

Mr. Butler. We don't take the wheel.

Mr. Hodges. I know that; nor the dam; but you render it useless.

Mr. Butler. It has got to be there during six months of the year anyhow. For the purpose of argument I will admit that the wheel cost \$150,000.

Mr. Hodges. We will accept that and not ask the witness

another question.

Mr. Butler. Because it would cost then so much more to make water-power as compared with steam.

Q. (By Mr. Hodges.) You have said that there were forty or fifty horse-power more now used?

Mr. Butler. He said the fifty without the forty.

Mr. Hodges. Fifty horse-power. For the purpose of argument I will admit that in view of the \$150,000 which you made it.

Q. When did you take possession, as superintendent, of the machine-shop?

A. About the first of October. I think it was about 1853.

Q. Eighteen hundred and fifty-three?

A. I think so.

Q. And you think it takes about fifteen horse-power for the machine-shop?

A. Yes, sir.

Q. Did Mr. Webber take any measurement of the power there?

A. Well, I told him what it took; I don't know whether he took it or not.

Mr. Hodges. It is not entered in the estimate that we have here.

Mr. Butler. I cannot object to your showing as many inaccuracies as you choose; I think you had better let him alone. He found exactly how much was running and how much power you had

Cross-examined.

Q. (By Mr. Butler.) Mr. Witness, do you have charge of the engine at all, — have general oversight of that?

A. Yes, sir.

- Q. Have you ever kept an account of how much coal that engine consumes?
 - A. No, sir; not till, I think, about 1872; since that we have.

Q. Since 1872?

A. I think so.

Q. What do you think of the heating requirements of your mill, more or less than in 1864, when you had the mill No. 3; I mean that portion of the mill that is heated by steam?

A. You want to know whether it takes more to heat now than

then?

 $egin{aligned} Q & \mathrm{Yes.} \\ \mathcal{A}. & \mathrm{Well, \ I \ should \ say \ it \ took \ a \ little \ more.} \end{aligned}$

Q. You take the heat directly from the boiler and not from the exhaust?

A. Yes, sir, from the boiler.

Q. Any means of telling how much coal is used by the year?

A. For the year?

Q. Yes.

A. To heat the whole concern?

Q. Yes.

A. Yes, sir.

Q. Well?

A. The company's books; that is all I know.

Q. I know the company's books will tell. You don't keep them?

A. No, sir; I don't keep any account.

Mr. Hodges. To heat or coal used?

To heat. Mr. Butler.

Q. You understood me to ask you to heat, didn't you?

A. Yes, sir.

Q. And the company's books, if they will produce them, will tell exactly how much it took?

A. No, sir; I am wrong. I misunderstood you, sir. No, sir, I

could not tell you.

Q. Is there any record kept without your telling?

A. No, sir; not that I know of.

Q. Is there any record kept of the amount of coal it takes to run the engine?

A. No, sir; it is all consumed in one fire.

Q. Is there any record kept of the amount of coal it takes to run the engine and the heating?

A. Yes, sir.

Q. Is there any record kept, and has there been since 1872, of the number of days the engine has run exactly?

A. I think there is; the engineer keeps that.

Mr. Hodges. I will furnish you with a statement from the engineer, General, and we will have the engineer here if you want him.

Mr. Butler. I think I would like to see the engineer, and ask him to bring his original books; he seems to be a very intelligent man.

Q. How do you think, sir, the amount of machinery compares now with the amount of machinery you had in 1843. For the whole concern now and the whole concern in 1843, was there a quarter as much, half as much, then, as now, or what?

A. Well, I should judge there might be 50 horse-power more.

Q. More now than there was in 1843?

A. Yes, sir.

Q. You have told us that there was 50 horse-power more than there was in 1843: didn't they have any more machinery in 1864, after they had been running on their government contracts, than they had in 1843?

A. Yes, sir.

Q. How much more did they have in 1864, than they had in 1843?

A. I could not tell you. Q. About how much?

A. I could not say exactly.

Q. Well, I don't suppose you said exactly when you said 50 horse-power?

A. No, sir; I don't suppose I did.

Q. Well, then, give us the same sort of an estimate?

A. Please to put that question again.

Q, Well, I will put another one first. You run as hard as you could and did all you could during the war when you run day and night?

A. We did so.

- Q. Now, then, you run somehow or other in 1843; I don't know how. How much more machinery did you have in 1864, after you had gone through the war, and after, than you had in 1843, twenty years before the war almost. Did you have half as much as you did in 1864?
 - A. Half as much more?

Q. Yes.

A. No, sir.

Q. Did you have half as much in 1843 as you had in 1864?

A. Yes, sir, we had more than half as much.

Q. Well, how much more; half as much?

A. I could not say.

Q. 60 per cent. as much?A. Well, we had considerable more, of course.

Q. What?

A. We had considerable more, of course.

Q. I know you had, and I want to get the percentae.g you 60 per cent. as much in 1843 as you had in 1864. You think you had more than half?

A. Yes, sir; of course.

Q. What was your answer to the last question?

A. I said we did.

Q. Well, how much did you have? Put it somewhere, - 62, 63, 64, 65 per cent.; never mind where you put it, only let us go on.

A. Do you want to know if we had 60 per cent. more? is that

the idea?

Q. No, sir. Had you half as much more? was the first question I asked.

A. No, sir.

Q. You hadn't?

A. No, sir.

Q. Had you within 40 per cent. as much machinery in 1843 as you had in 1864?

A. Well, sir, I could not tell you.

Q. Very well, we will leave it there. Now, then, how many blankets did you use to make a day in 1843, when you were running full?

A. Well, sir, that is something that don't come under my head at all.

Q. The company's books, I presume, will show that at the mills?

A. Yes, sir.Q. Did you make half as many as you did in 1862, 63, and 64, during the war?

A. That is what I could not say.

- Q. Well, in your judgment? You were there and saw the works.
 - A. Well, I should think we made half as many more.

Q. When — in 1864 as you did in 1843?A. Yes, sir.

Q. That is, suppose you made 100 blankets a day in 1843, you think you made 150 in 1864 only — is that what you mean?

A. Yes, sir.

Q. Well, you didn't speed up so very much, did you, and didn't get so very much more machinery in that case?

Mr. Hodges. They worked all night, General.

A. We speeded up and worked nights.

Q. You speeded up and run nights, and speeding up and run-

ning all night you didn't make only half as many more blankets in 1864 as you did in 1843?

A. Well, when we run nights we made as many again. Q. You made as many again when you run nights?

A. Yes, sir.

Q. Now take a day's work. You worked only daytimes in 1843?

A. That is all.

Q. And except when on this war-contract, you never did work nights, did you?

A. I presume they might; not much, not as a general thing.

Q. You might have worked some nights upon occasional repairs or otherwise, but I mean to run the mill regularly at nights?

A. No, sir.

Q. Now, then, how many more blankets do you think you made in 1864, in a day's work, than you did in 1843, in a day's work?

A. Well, I presume we made twice as many.

Q. Now, then, isn't the blanket machinery much the heaviest portion of your machinery?

A. Yes, sir.

Q. Throw off all the manufacturing machinery and run your blanket machinery alone, what proportion of power would you be using?

A. Well, sir, I think we might be using something over two-

thirds.

Q. Something over 67 per cent., then?

Q. (By Commissioner Russell.) You mean for blankets?

A. Yes, sir, for blankets.

Q. (By Mr. Butler.) Throwing off the rest of the machinery and using the machinery necessary to run your blanket-works fully and thoroughly, you would be using something over two-thirds? How much over two-thirds — 75 per cent.?

A. Well, I could not say exactly.

Q. That is to say, the blanket-works are by far the heaviest works, and there is the most machinery in them?

A. Yes, sir. Q. That is what I desire. Now, sir, I suppose your machinery is graduated so that your spinning corresponds with your weaving, your weaving to your finishing, and your carding to the spinning; isn't that so?

A. Yes, sir.

Q. And it would neither be profitable nor proper, in carrying on your manufacturing, to card twice as much in a day, if you were running everything full, as you could spin, or spin twice as much as you could weave, or weave twice as much as you could finish, would it?

A. No, sir.

- Q. What was in No. 3 mill, what sort of machinery had you $ext{there}$?
- A. Well, we had two sets of cards—two or three, I don't recollect which.

- Q. How many sets of cards had you in all?
- A. Well, there are ten sets in No. 2.

Q. How many sets in No. 2?

A. Ten, I think.

Q. Any anywheres else?A. Yes, sir. In No. 1.

Q. How many sets there?

A. I could not tell you just how many sets there are.

Q. If you were so driven with work that you wanted to do all you could, it would do no good to run No. 3 any longer than it would to run the other mills, would it?

A. Only in case we got out of wool; the pickers were in

No. 3.

Q. I understand No. 3. Well, if you were out of wool you would not run the pickers at all?

A. Out of wool for the cards I mean in the other mills.

Q, Out of wool for the particular manufacture that was being carded for in that mill?

A. Yes, sir.

Q. I am upon this point, sir. Your machinery being graduated with each other, it must all go together somehow?

A. Yes, sir.

Q. Therefore it would do no good to have power to operate one mill, when you could have power to operate all the rest, if you were running full: that is so, isn't it?

A. Yes, sir.

Q. Now, Mr. Hill, how many days did you run by steam last year?

A. Well, sir, that is a question I cannot answer you.

Q. Do you ever run by steam in the winter?

A. Yes, sir.

Q. When there is water enough?

A. No, sir; we don't do that when there is water enough.

Q. But when ice, anchor-ice, and other ice, stops you?

A. Well, we may have sometimes put it on; it is very seldom that anchor-ice troubles us.

Q. But the freezing up of the streams troubles.

A. It don't trouble us much; it does sometimes; it gets a heavy body of ice on.

Q. And then you have to run by steam in the winter?

A. Yes, sir.

Q. Well, now, Mr. Hill, is not this it: that for six months in the year you have work enough more than twice to run your mills, and run to waste at that. Take six months out of the year, on an average, the spring and fall months, say commencing after the equinoctial in September, and then running on through September. October, November and December, according to whenever the rains begin, and January, and then choked up by ice a little; and then the latter part of January, February, March, April and May, and at the middle of June—haven't you a surplus of water so that you can run your mills night and day and have something over the dam besides?

A. It may not run over the dam all the time; it runs occasion-

- ally. There are "ups and downs," you know.

 Q. Of course there are "ups and downs," but is not there substantially water enough to run your mill night and day, and waste over the dam besides?
 - A. Sometimes there is and sometimes there is not.

Q. I mean in those months?

A. Not always. Q. As a rule?

- A. Well, as a general thing, before the Boston folks took the water.
- Q. Yes, before the Boston folks took the water it was so, I know. I mean that, of course. Now, sir, have the Boston folks took a spoonful of water to your knowledge during the wet months up to this year?

A. I could not say, sir, who took the water.

- Q. Well, did anybody take the water? A. I could not swear that anybody did.
- Q. You put in "before the Boston folks took the water." I didn't, you see.

A. I knew about the time, for we felt it at the mill.

Q. You felt it?

A. Yes, sir.

Q. When did you feel it; in the wet months?

A. I have kept no recollection or date of these things.

Q. Well, pardon me. You remember some time, for you felt it?

A. We felt it when they drawed it.

Q. Well, when did you feel that they drawed it? You say you felt it there at the mill; what January was it, or December was it, or November or October?

A. I could not say, sir.

- Q. Was there any October, November, December, January, February, March, April or May, or June, when you felt it? A. Well, I could not tell you just what months it was.
- Q. I am talking about the wet months now, and I asked you, Mr. Hill, if there was any want of water to run your mills night and day in the wet months, and you said "yes;" but you didn't know there was before the Boston people took the water. Now that was the way you answered me, wasn't it? Now I ask you if any wet months you will swear to, or you will swear there was ever a wet month when you felt the loss of water from the Boston people taking it, and if so, when was it?

A. I could not swear to any particular month.

Q. Well, any particular winter? Any one set of months, what we call wet months?

A. I could not state to any particular month now.

Q. Well, any six months; any wet six months? I am now talking about the wet months. I will admit it makes a difference in the dry time.

A. We have felt them taking it out; of course, we knew some-

body did take it.

Q. I don't know whether you did or did not. Do you remember any time when they took the water, in any October, any November, any December, any January, February, March, April, or any May?

A. Well, I felt that we had less water then; we generally have

a good deal.

- Q. In what wet months of the year; was it in 1872 when they began to take?
 - A. Yes, sir. Q. It was?

A. Yes, sir.
Q. You remember about that, do you?

A. Yes, sir; I do.

Q. Well, what would you say if it should turn out that all the water they took was from June 21st, and ended September 16th, 1872, and they never took any then for three years; what should you say then?

A. Well, I should say that we ought to have had water. Q. When you didn't get it?

A. Yes, sir; when we didn't get it.

Q. That is, they ought to have found you some when they didn't take any? And you really think now, do you, Mr. Hill (I have no doubt you honestly think so), that in the winter time the Boston taking injured you?

A. Yes, sir.

Re-direct.

Q. (By Mr. Hodges.) Mr. Hill, turn back to the winter of 1876, the past one, and to the winter of 1875, a year and a half ago, and see whether you remember any diminution of the water in either of those winters?

A. I don't distinctly recollect about the winters myself.

Q. Now, sir, turn to mill No. 3: I asked you in the beginning what the uses of that mill were?

A. Of No. 3?

Q. Yes. Will you now state them?

- A. No. 3 had in two pickers and two sets of cards or more, I forget which, one jack, and three fulling-stalls, one pushing and two rotary.
- Q. What I mean, sir, is, did that mill contain a train of machinery by which it took the wool and carried it through all the departments of manufacturing, or whether it prepared wool for the uses of the other mills?

A. It prepared wool for the uses of the other mills.

Samuel Webber, recalled.

Q. (By Mr. Hodges.) Mr. Webber, did you measure the pump, the extractor, in the basement of mill No. 4?

A. I did not.

Q. Did you measure anything in mill No. 4?

A. I was not aware there was a mill No. 4; saw nothing whatever.

Cross-examined.

Q. (By Mr. Butler.) That is to say, you didn't measure but three mills?

A. Yes, sir. Q. You measured in three different mills, didn't you?

A. Yes, sir.

Q. No. 3 mill had been burnt some years. If I understand this case, you didn't measure in that one?

A. I measured no pump whatever; I am sure of that.

Q. Pardon me. Did you measure all of the machinery, from bottom to top, that Mr. Hill showed you?

A. Yes, sir.

- Q. And he showed you all the machinery in three buildings called mills?
- A. Well, I will not say he showed me all the machinery that there was there. I know for certain I measured no pump.

Q. There were three different buildings?A. Yes, sir.

Q. If he showed you any machinery you estimated for it and measured it, didn't you?

A. Yes, sir.

Q. Now here is the difficulty, Mr. Webber. There was once a No. 3 mill, which was burned long ago, so you didn't measure that. There are now standing three mills; so far as you know, did you measure or estimate all the machinery in the same three mills that there were?

A. So far as I know, I did.

Q. And you are sure you did all that Mr Hill showed you?

A. Yes, sir.

Q. If you left out any considerable amount of machinery, then all the nice calculation between your measurement and the amount of power which the engine was indicating would all go for nothing, wouldn't it?

A. Yes.

Re-direct.

Q. (By Mr. Hodges.) Mr. Webber, there is a large mill there with machinery in it that is not in operation, isn't there?

A. I think there is. There was a building in which I was told there was nothing in operation, and which I did not go into.

Q. The three mills that you went into — mill No. 1, where you found 240 horse-power or 239 odd, and mill No. 2, where you found 86 or thereabouts horse-power. Mill No. 2 has connection with it another mill, has it not?

A. It has.

Q. And you measured machinery in that mill?

A. I did.

Q. And you called it both mill No. 2, did you not?

A. Yes, sir.

Q. And it is so entered in your minutes?

A. Yes, sir.

Q, Now, did you measure one pump, one wool-washing machine, two extractors, and two worsted-yarn washers?

A. I did not.

Re-cross.

Q. (By Mr. Butler.) Why not?

A. I didn't see it.

Q. Would you have made it if you had seen it?

Q. Then Mr. Hill never showed it to you, did he?

- A. Not to my knowledge. I have no recollection or memorandum of it in any way.
- Q. Now, then, you are acquainted with such machinery that has been described to you, are you not?

A. Somewhat.

- Q. In your judgment, how many horse-power would that take?
- A. I should say two extractors would be two horse-power each, that would be four; wool-washing machine would be two more, which would be six; and the pump another, would be seven.
- Q. (By Mr. Hodges.) How about the worsted-yarn washers? A. The worsted-yarn washers which I have noticed, I cannot conceive that they will be of any great horse-power.

Q. (By Mr. BUTLER.) The two extractors would be how many horse-power?

A. Two each.
Q. That would be four. The wool-washer?

A. I should allow about two more for the wool-washer; it is a machine of very slow motion.

Q. That would be six. The pump?

A. Not over one.

Q. That is seven. Two worsted-yarn washers?

A. Well, I cannot imagine that two yarn-washers would require over a horse-power each.

Mr. Butler. That is nine.
Mr. Hodges. The only difference I make between his calculation and that I have is, that I have it entered that the two extractors are 2½ each instead of 2, and the wool-washer is 5, but we will call it 9.

Q. (By Mr. Butler.) Then there is nine horse-power?

A. Yes, sir.

Q. Now you told us that the indicator showed that just about so much horse-power was used, which you found there was used. Would it make any difference to your calculation if you had found the engine was carrying nine horse-power more?

A. It would have made no difference in the calculation.

Q. Wouldn't you have thought there was some mistake in your calculations when you came to look at the indicator?

A. I don't know that I should. There is always a liability of one or two per cent. error in measurements in any of these matters.

Q. But you have allowed so much difference between the indicator and the dynamometer. You just allowed about so much difference between the indicator and the dynamometer.

ence and you found about so much difference?

A. I took my measurements from my dynamometer in the first place entirely and independently and made it up, and afterwards in order to verify it I took the measurements of the indicator of the steam-engine, and I found the difference; and I found machinery enough standing still to account for that difference.

Q. I don't remember at this present moment how many horse-

power it is you found?

A. Eleven horse-power — eleven and a half.

Q. Now, if the indicator was actually carrying 9 horse-power more, which is almost double the difference, what should you have said then — that you were just as correct as you were before?

A. I should say I had no change to make in my calculation.

Q. You would have no change to make in your calculation, but would you have found your calculation verified by the indicator the same as before?

A. Well, I don't think myself that the indicator is entirely so reliable a mode as the dynamometer.

Q. But you went to it for the verification?

A. I went to it for the verification.

Q. If you had found the difference 20 should you have been just as satisfied with your measurement as if you had found it 11?

A. No, I think I should have been tempted to have made some

further examination.

Q. Well, now we know that there was 9 horse-power or more running by that indicator at that hour?

A. Well, I don't know that this machinery was in operation of

my own knowledge.

Mr. Butler. I know; but it is assumed here and put in as in operation, and Mr. Hill says he showed it to you in operation. That is all.

ELIPHALET WATSON, sworn.

Q. (By Mr. Hodge.) What is your residence?

A. Andover.

Q. What is your occupation?

A. Machinist.

Q. Do you know the Saxonville mills?

A. I think I do.

Q. When did you first know them?

A. I think it was in 1842.

Q. How long were you acquainted with them—that is, how long were you there?

A. I was there nineteen years.

Q. What was your business there?A. I had charge of the machine-shop — all the mechanic work.

Q. Was Mr. Hill there at the same time?

A. Yes, sir; he was there at the same time.

Q. You left there when, do you think?

A. About 1865, I think it was, when I left there. I was there nineteen years.

Q. What time was it, relative to the war, that you left?

A. I have no dates exactly to give about that. It might be, perhaps, six years before the war — five or six, I won't say certain which.

Q. But you were there nineteen years?

A. Yes, sir.

Q. And beginning in 1842, that would take you to just before the war — 1860?

A. Yes, sir.

Q. Well, sir, at that time were you observant of the water?

A. I think I was.

Q. Looking back over those nineteen years, tell us what portion of the year, taking one year with another, you could run the ma-

chinery in the mills by water?

A. Well, when I was there, they would generally throw off one of their mills about the first of July, and from that to September. Then they would commence running mostly by water. From the first of July to the first of September.

Q. What would they throw off the first of July?

A. Well, they would throw off what they call No. 1 mill, and No. 2 and No. 3 during those two months they would run more or less by water in both of those mills.

Q. But except those two months, your recollection would be that all the mills were run by water?

A. I should think they were, sir.

Q. And in those two months No. 2 and No. 3 would run more or less during the season?

A. Yes, sir.

Q. What should you say about running the mills by night when

you run them by day? Did you ever run them by night?

A. Oh, yes; they run them considerable by night. When they run nights generally they run by water, because there was water enough. If they had water through the day, why they would have water through the night.

Q. What should you say, then, to their running those mills by night in those times when they run by day? Could they do it for

a substantial part of the time?

A. No, I should think not.

Q. Well, how many months of the year could they run by night and by day both?

A. Eight months.

Q. Were you there when they put in the first steam-engine?

A. Yes, sir.

Cross-examination.

Q. (By Mr. Butler.) I want simply to ask you this, Mr. Wittess: what goods did they make in 1842-43?

A. They manufactured worsted and woollen blankets.

Q. Which the most?

- A. Well, I don't know; about equal, I should judge. I should think more blankets than worsted.
- Q. Do you mean that they had more blanket machinery than worsted machinery?

A. About the same.

Q. Before they had any engine, what did they use to do when the water was short, and they stopped the mill; did they discharge their help?

A. No, sir.

Q. What did they do, then?

A. Why, they retained their help; they used to keep their help.

Q. Pay them?

A. They used to pay their board, at any rate.

Q. They used to pay their board, but not their wages?
A. I believe not their wages. I won't be positive about that.

Q. What relation had you to the mill? A. I had the machinery to look after.

Q. Do you mean to say that they paid all their help while their mills were stopped two months?

A. I can't say that they did or did not.

Q. Do you believe that they did? A. Oh, they paid their board.

Q. Then their books would show exactly how long they used to be stopped, wouldn't they, when they had not any engine to run, because they would show exactly how long they paid their help?

A. I suppose so.

Q. Where were the books kept?A. The books were kept in their counting-room.

Q. Has the counting-room unfortunately ever burnt down?

A. No, sir.

Q. You have never heard of any loss of books belonging to the mill, have you?

A. I have not; no, sir.

Q. They didn't move the books down to the Boston office, and have them burned up in the great fire, did they?

A. Not that I know of.

JOHN GIBBS, sworn.

Q. (By Mr. Hodges.) Where do you reside?

A. North Billerica.

Q. What is your occupation?

A. Carder.

Q. Do you know the Saxonville mills?

A. I do, sir.

- Q. When did you first get acquainted with them, or know them?
- A. When I first came there. I went to Saxonville in the fall of 1830, when Head & Co. owned them.

Q. How long did you remain there?

A. Until about 1865 or 66. I am not certain.

Q. After the war?

A. Yes, sir. I had charge there during the war of a part of No. 2, and the whole of No. 3.

Q. Were you there when No. 3 was burned?
A. I was not, sir; that was soon after I left.

Mr. Butler. Can't you fix the time when it was burned?

Mr. Hodges. I will ask him. I intended to have asked Mr. Hill.

Q. Do you remember when it was burned?

- A. I do not. It was after I left. Mr. Hodges. It was in 1865 or 66. Mr. Butler. That is near enough.
- Q. During the time when you were there, from 1830 to 1865, you were passing from one grade of duty to another?

A. I was.

• Q. And at last you were in charge of the carding at mill No. 3, and part of mill No. 2?

A. Yes, sir, and spinning.

Q. What time did you take charge?

A. I think it was 1851 or 52.

Q. Now, sir, during your acquaintance with these mills, tell us what portion of the time the machinery was run by water, averaging one year with another?

A. I should think that the mills could run near nine months in a

year by water; say eight and a half to nine.

Q. Then, after they had run eight and a half to nine months, what was done during the remaining three or three and a half months as to the use of water?

A. Well, they used all they could get as it came.

Q. Yes; but I speak of what was done. Did they run one, two, or more or less of the mills with water?

A. They usually took off No. 1 mill, and run No. 2 and No. 3; No. 3 running all the time as much as they could, sometimes taking off No. 2.

Q. Well, sir, prior to the time when the steam-engine was put in there, do you remember any time when all those mills stopped entirely?

A. I never remembered any.

Q. Since the engine was put in, do you remember any time when they stopped entirely for the want of power?

A. No, sir; I do not.

Q. How much time can all the mills run nights, taking one year with another, assuming that they likewise run in the daytime?

A. I should think that they might run six months, certainly; and then, I should think, they could run No. 2 six months longer. That would be the best of my judgment about it.

Cross-examination.

Q. (By Mr. Butler.) Did you keep any record of your carding?

A. I did not, sir; only the amount of yarn that we spun, because the men were paid from it. It is generally customary that the carder knows about how much he is doing on each machine.

Q. Didn't you keep any account of how much wool you re-

ceived, and how much wool you turned out?

A. No, sir; because I ordered the wool from the boss of the yard. He kept that. The books show how much wool I used.

Q. Did he keep any account?

A. He had to keep an account of the wool he delivered.

Q. Delivered to each boss of carding?

A. Each department; yes, sir.

Q. Then the spinner—did he keep an account of what he got from you?

A. I kept an account of his work, and booked it, because he is

paid by the pound.

Q. Then that account must show exactly what was done every month?

A. Yes, sir; the books at the office will show.

Q. Then the company have it in their power, if they kept their books, to show exactly how many days their mill has worked ever since 1830 up to 1865?

A. The New England Worsted Co. was not there in 1830.

Q. When did this company begin there? A. They began about 1833 or 1834.

Q. Well, from the time they began, they ought to have the means of showing every day they worked, ought they not?

A. I should think they certainly had.

Q. They can show exactly how much No. 3 was run, exactly how much No. 2 was run, and exactly how much No. 1 was run. The machine-shop was only a repair-shop, was it?

A. That is all.

Q. And when No. 1 and No. 3 were stopped, the machine-shop had very little use for power, had it?

A. Generally more, because they generally made repairs on the

machinery when they stopped for any purpose whatever.

Q. What was the wheel rated at which was in No. 3 when you first knew it, before they put in the turbine wheel?

A. That I can't tell you.

Q. About what? It was a breast-wheel?

A. Well, I am somewhat unacquainted with the power of breast-wheels, it is so long ago since they used them, but I remember well when they were all three in. I should think that No. 3 wheel might be 50 or 60 horse-power—a breast-wheel.

Q. That is when the turbine was in, you mean?

A. No, the breast-wheel. I should think it might be about that, 50 or 60 horse-power.

Q. You don't remember whether that mill ever fully stopped for

want of water?

A. Since the New England Worsted Company owned it, since 1833 or 34, I don't remember any time when it fully stopped for want of water. It might have done so once or twice, but I don't remember it.

Q. I suppose, about this running nights, all you mean to say is that during the wet months there was water enough to run all the mills night and day, and to spare?

A. I do think there was.

Mr. Butler (to Mr. Hodges.) Now, I wish you would bring

those books that I have proved in your possession.

Mr. Hodges. I don't think the proof is quite sufficient to satisfy me that I have got them. I am easily satisfied on that subject.

Rufus A. French, sworn.

- Q. (By Mr. Hodges.) Where is you residence?
- A. Saxonville, Mass. Q. Your occupation?

A. Weaver and warper, etc.

Q. Do you know the mills that we are talking about?

A. I am somewhat acquainted with them, sir. Q. How long since you first knew them?

A. I have worked in that yard since 1829, with the exception of about two years and a half.

Q. In what capacity have you worked there?

A. The first year, I worked ten months and a half at weaving, and about four years at warping, or dressing, as it may be termed, in connection with the weaving. The remainder of the time I have had the charge of the weaving.

Q. What is the relative amount of machinery now in the mills compared with that, I will say, in 1844; and (to make it clearer) about the time the first steam-engine was put in?

A. I should think there was 25 per cent. more.

Q. By that you mean, probably, requiring 25 per cent. more

power?

- A. This is a guess. I can't say that it is positively so, but as near as I can calculate by the increase of machinery from time to time, it appears to me that it might be not exceeding 25 per cent.
- Q. How much more is there now than there was in 1865, at the close of the war?
- A. Well, I should say not much, sir; very little. Really, I can't say. There probably may have been some small affairs added. should think not a great deal.

Q. What was done with the machinery that was contained in

mill No. 3, when that mill was burned?

A. It was burned up, mainly.

Q. Has corresponding machinery to that which was then burned up been placed in the other mills or buildings there — something,

doing the same work that machinery did?

A. I have so heard from time to time, that they changed the machinery in No. 3, and it was put in the store-house frequently; and there was machinery stored away which has been put in operation since the burning of No. 3, in different parts of the mill; as, for instance, five spinning frames were stored in a building, and there has been one set of cards introduced in No. 2, that were laid

away, that formerly belonged to No. 3.

Q. Now, beginning at your first acquaintance with that mill, and coming down to this time, what should you say was the average time during the year, taking one year with another, that the machinery in the mills was run by water?

A. I should say not exceeding eight months, in the daytime.

Q. How with regard to the remaining four months?

A. For the remaining four months, I should think that it run both night and day the most of the time. That would embrace the wet season of the year, in which, when we run all the machinery, the water will run over the dam for successive weeks-sometimes months.

Q. I mean, sir, when all the mills have run for eight months in the year, there then remain four months. Now, how much, if any,

of the machinery could be run during those four months?

A. Well, I should say that the machinery would be run mainly

by water; but at intervals.

Q. I am speaking only of running the machinery by water. I mean the remaining four months. How much of that machinery could be run by water, if any of it? Say, begin with mill No. 3. You have run all your mills eight months, and you come down now to a period when you cannot run them all. Now, what did you run for the remaining four months, if anything, by water?

A. Well, they would be changing, as I said before, — run some by water and some by steam, perhaps; but after taking into the account the whole, I took the average. You assume by your question that they should run all the machinery eight months in the year, in the daytime; that was all I thought the water would do; and yet there were other seasons of the year, in wet time, when, if we should have all the machinery running, it would run it night and day, month after month, for perhaps several months, there would be such a flow of water. Does that answer your question?

Q. Not entirely. We will suppose, Mr. French, that you have been running the mills from the first of September to the first of May by water. The water then slacks, and there remain June, July, and August to complete the year. Now, what machinery, if any, did you run, during your acquaintance with the

mills, during those seasons, by water?

A. Well, there would be a very great variation. It is something I have made no minutes of whatever, in past time, and it would be impossible for me to tell, as we had to change sometimes twice a day, and even more than that sometimes, from steam to water, and from water to steam, just as circumstances required. It is hard to compute it, and yet I thought your question embraced in the first place the whole thing.

Q. Well, sir, I know it is hard, because you are speaking from memory without notes; but tell me another thing. Did No. 3

ever stop for want of water?

A. Well, sir, I think it has a very, very short time, perhaps a few times; but generally it has run right straight along.

Q. Do you remember about when it has stopped?

A. I can't give you dates; it might be for a few hours, even, but very seldom.

Q. At times, when you took off No. 1, did you continue to run

No. 2 and No. 3?

- A. Well, that would be according to the amount of water there was; perhaps there would be enough to run No. 2 and 3, and if so, let it come half a day, and then change; that has been the custom.
- Q. Turning back, tell me if you remember any time during your acquaintance with the mills when the mills stopped running entirely for the want of water, and if so, when, and how long it continued?
- A. Well, I remember of their stopping certainly once; I don't know as I can tell you precisely the time; they stopped a number of weeks, I think, once.

Q. What do you mean by a "number of weeks,"—two weeks?

A. Well, two or three certainly; I don't know but more; I had an idea it was more; but still two or three weeks. We stopped about the time we put in the English engine, I think it was; let me see. I started up 9 bunting-looms in 1842, and I think it was the next year the engine started.

Q. In 1842 or 43, you say now, the time they started up the

engine?

- A. I think it was in 1843; it might be 1844 that the engine was started.
- Q. You refer to the first engine that was put there? That is what I want to get at.

A. I do, sir.

Q. You think that just previous to that there was a dry season when the mill stopped?

A. I think it was about that time.

Q. Do you remember their stopping at any time before that?

A. Well, I do, but I don't; that is to say, as to date. think I had been in Saxonville some four or five years when they stopped, in April, and we stopped for three months, the last time. It was a very dry time. The year 1834 or 35, I should think it was. But never since that, nor previous to that, did they stop so much as at that time.

Mr. Hodges. I assume that you have not stopped since you had an engine in, because you have had something to do the work besides water; therefore I have not asked any questions about

that.

Cross-examination.

Q. (By Mr. Butler.) Mr. Witness, what was done there before 1844? What did they make? It was then the New England Worsted Co., and they only made worsted work, did they?

A. They made flannel at the start, in No. 2 mill, in 1829, and continued it along until Coolidge, Poor & Head, the company that was then in there, made an assignment, at which period I left Saxonville, at that time.

Q. That failed them; then what did they go to doing?

A. They made flannel previous to that time. Then, after that, as I stated, I left Saxonville. As they proposed to work up the stock and close up, I got a job at Fitchburg, and left. I returned in about two years and a half, dating April, 1838.

Q. What business was started up then?

A. The New England Worsted Co. came there to start up their worsted works, and also to make blankets.

Q. How long did they continue the worsted business there?

A. They have continued it until the present day.

Q. Under another change of name?
A. Under another administration.

Q. In 1843, what was the product of those mills compared with what it is now, when they were running full, doing the best they could then, and doing the best they can now?

A. It is impossible for me to say. I can say, in regard to my own room, just about the same thing one year with another, for

these forty years.

Q. And yours is what?

A. Weaving.

Q. Weaving what?

A. Blankets.

Q. The blankets would run along about the same all the time?A. Yes, sir. We do about 320 blankets a day, on 17 looms.

Q. How much did you do during the war?

A. Well, sir, we done something more than that, because we run extra time.

Q. How much extra time?

A. Well, sir, I fared a little better than some of the overseers, for Mr. Simpson told me what he wanted done, and told me I must run night and day. I objected. I asked him how much he wanted, and he told me how much he would be satisfied with, whether I run nights or not; so I run a day and a quarter and done the work.

Q. How much work did you do in that time?

A. I can't tell you exactly; but I done done enough to satisfy him that he got a day and night's work.

Q. Did you do that by speeding up your looms?

- A. We did speed them up some. Well, we worked with a little more vim.
- Q. And you were paid for a day and a quarter, and the rest of the mill had pay for a day and night, and only kept up with you?

A. It was just about so; pretty much so.

Q. Well, then, it would have been a more profitable business for them to have speeded up the rest of the work and kept up with you, and paid for a day and a quarter instead of two days' work, besides losing the gas?

A. Perhaps the rest were not so smart as I was.

Q. Which did you light with at that time, oil or gas?

A. Oil, at that time.

Q. So this running all night with water all night was not a very

profitable business for him, was it? He better have run a quarter of a day longer, and not used his water all night, as you nnderstand it? That is so, isn't it?

A. Well, he made an exception of me, sir; I am not able to say why exactly. I done a pretty good day's work. He was

satisfied with it.

Q. He was satisfied with it; but you had to keep up with the rest of the production?

A. I don't know what his estimate was.
Q. I did not ask you that; but you had to keep up. They could not make blankets until you wove them?

A. No, sir.

Q. They could not finish them until after you wove them? It was no use to spin any faster than you could weave, so that you were the regulator, after all?

A. (The witness did not reply to the question.)

(By Mr. Hodges.) You did not do all the weaving, did you?

A. No, sir; only about one-third.

Q. (By Mr. Butler.) Thanks! And you, by hurrying up your matter, and having only one-third of the weaving to do, kept up with those who wove all night?

A. I worked on the coarse work machinery, and perhaps there was a difference made about the propriety of running my work. I

worked mainly on the coarser kind of work. Q. Army blankets, and that sort of things, I suppose?

A. Yes, sir.

- Q. And that, of all work, could be done best at night, could it not?
- A. I should say it could. No, I won't say that. But still, we did not work quite as good stock. It would not work quite as well as white blankets.
- Q. You could have got along a good deal faster if they had given you better stock, couldn't you?

A. I suppose so.

Q. You said that at some time they started up the making of bunting there — when was that?

A. 1842.
Q. How long did that manufacture continue?

A. From six to eight years.

Q. For whom? General merchandise?

A. Yes, sir; for the market. It was sold in Boston, New York, Philadelphia, and the market generally.

Q. They stopped that?A. Yes, sir.

Q. And did not begin it again?

A. No, sir.

Q. They stopped it, then, about 1850? Was that so?

- A. 1848. I have the record of the work, I believe, about the last.
 - Q. Very like; but about what time did they stop it?

A. About 1848.

Q- Did they keep on with their worsted work?

A. Yes, sir.

Q. That bunting, I have understood, was made of worsted?

A. Yes, sir; warping and filling.

Q. Did they double and twist the filling, do you remember?

A. No, sir.

Q. Did they double and twist the warp?

- A. No, sir. They had to size it pretty well in order to lay the fibre down.
- Q. The sizing would wash off, I suppose, in the rain, if it was out in a storm?
- \mathcal{A} . Glue size will, sir. That is what I used; the very best thing.

Q. Did you sell any to the navy or army, do you remember?

A. I don't know, sir, where they sold it. Adjourned to Thursday, at 9½ o'clock.

THURSDAY, September 28th, 1876.

JOSEPH P. FRIZZELL, sworn.

Q. (By Mr. Hodges.) What is your occupation?

A. I am a civil engineer.

Q. In what department of civil engineering, if you have any

special department?

A. My employment has been mainly, for most of my professional life, in the line of hydraulic engineering, — dealing with water, in one shape or another.

Q. Have you made an examination of the Saxonville fall?

A. I caused the fall to be measured at Saxonville.

Q. Did you yourself examine it?

A. I did, so far as to be satisfied that it was about correct.

Q. What is the height of the fall? State the result of your examination.

A. The river at [the time of measuring the fall was not in its ordinary condition; the water below the dam was a good deal lower than it would have been when the river was flowing; for that reason, there is a little correction to be made. There are two falls; there is one at Saxonville, and then there is a small fall some distance above. The one at Saxonville is 25.29 feet, as near as I could make it. The upper fall; (the grist-mill fall) is 1.67 feet; it was at that time. Reckoning the fall at the top of the dam, it was 1.67; but at present, over the flash-boards, assuming that those flash-boards are correct, that they have a right to use those flash-boards, the fall at that point would be 2.58 feet.

Mr. Hodges. We have that right.

Q. How do you make the fall at the large dam? 25.59 from

the top of the dam?

A. From the top of the existing flash-boards to the surface of the water at the outlet of the race, making allowance for the rising of the water in the race when the river is running. The river was substantially cut off when the levels were taken.

Q. How would it be if you reckoned the fall below the race from

the level below to the top of the flash-boards of the dam?

A. From the level below the rapids?

Q. Yes, sir.

A. That would add 2.8 feet fall.

Q. Those rapids are immediately below?

A. Yes, sir. This would be levelling to a point some 800 or 900 feet in a straight line below the mill; in a straight line, not following the bend of the river.

Q. (By Mr. Butler.) That is, the stream runs off rapidly until it comes to a level?

A. Yes, sir.

Q. (By Mr. Hodges.) You mean, that bridge that crosses about here [indicating the point on map].

A. What is called "Elm-street bridge;" between the race of the mill and Elm-street bridge there is a fall of 2.8 feet.

Cross-examination.

Q. (By Mr. Butler.) Is that a ledge behind the mill where the rapids are?

A. I think not.

Q. Gravel?

- A. Yes, sir; it is gravel, and further down there is a good deal of sand.
- Q. Do you know whether the water is backed up to what you call the level, by the dam below?

A. It was not at that time; I don't know how it is now.

Q. When was that time?

A. That was the first of September, this year, that the levels I speak of were taken.

Q. No water was running at all?

A. Barely a perceptible current; three or four cubic feet per second, perhaps, running in the channel.

Q. Do you know whether that level to which the rapids come is

the head of a mill-pond?

A. I can't say; I should judge not.

Q. (By Mr. Hodges.) There is no dam between there and North Billerica, —29 miles?

A. No, sir.

Francis W. Bacon, sworn.

Q. (By Mr. Hodges.) What is your occupation?

A. Machinist and engineer.

Q. Have you made an examination of the steam-engines and the appliances in use at the Saxonville mills recently, and when?

A. I have, sir, recently. September 4, I made an examination

there.

Q. Will you state the result of that examination?

A. I found two steam engines, each of 20-inch cylinders, 48-inch stroke, making 52 revolutions per minute.

Q. Under what pressure?

A. Eighty pounds' pressure when I saw them. What we call "high pressure condensing." The vacuum, by gauge, showed 15 to 23 inches; the mean would be 19 inches; equal to about nine and a half pounds. The point of cut-off I could only guess at; not putting an indicator on, I could not tell exactly.

Q. With your experience of engines, you could tell with suffi-

cient accuracy, couldn't you?

A. Well, I can give you a supposition on the point of cut-off,

and the result that would follow that theoretically.

Q. Well, if it can be different from that, I don't know as I care about it; I don't think it of very much consequence, any way.

A. I can give you the capacity of the engine commercially.

Q. What does the engine indicate?

A. I am told — I know nothing about it —

Q. The engineer is here; he can tell that. Now, sir, in the first place, with such an engine as that, and taking the ordinary engineering, as your experience shows it to be in this part of Massachusetts, what would be the consumption of coal for ten hours? Ten hours is as well as any other time; take ten hours.

A. Suppose it indicates 320 horse-power, the consumption of coal—I have not those figures, only the cost of the amount of

coal.

Q. Well, sir, you know substantially what such an engine would demand per hour per horse-power, and we want the result of your

experience, as an expert, in such matters.

A. My experience shows that factory engines, as a rule, will call for about, as we find them, not perhaps as we would have them, but as we find them, would call for about four pounds an hour for each horse-power.

Q. Varying from some figure less than that to some figure

higher than that?

Mr. Butler. I guess not. What would be the variations? Don't lead him, please.

A. Well, from two and a half to fifteen pounds.

Q. You mean a consumption from two and a half to fifteen

pounds per hour?

A. Take that type of engine, as I find them in factories, I am safe to say that it would require four pounds an hour per horse-power.

Q. (By Commissioner Francis.) This is a double-cylinder

engine?

A. This is what we know as a "double-cylinder engine," both

working on one shaft.

Q. (By Commissioner Russell.) Now, do you treat that as a 320 horse-power engine? You began an answer here by saying, "For such an engine indicating 320 horse-powers." You speak of that as one double engine?

A. I mean this one double engine, high pressure condensing.

I am speaking of a double engine, working on one shaft.

Q. (By Mr. Hodges.) Now, Mr. Witness, I want to get the cost of such an engine, the setting, and the other appliances for placing upon the working shaft of the mill, the power produced by

the engine. Will you state it in detail, as you know it?

A. There is one addition to the character of this engine that I must make. It is what we know as a "geared engine," or, in other words, the fly-wheel of the engine has a toothed wheel, and plays into a jack, enhancing the cost somewhat of the machine. The cost of that engine, set up ready to run, I put down at \$10,000 There were eight boilers, known as "cylinder tubulars,"

4 ft. in diameter, 15 ft. long, 5,600

The number of tubes is 48, 3 inches in diameter.

The setting of the boilers, 2,000

Connecting boilers with engine,	\$1,100
Chimney,	2,000
Shafting, pulleys and pedestal-boxes,	760
Belting,	417
Morton condenser,	7 50
Supply pump for boilers,	475
Total,	\$23,102
10041,	\$20,102

That includes the engine, boilers, chimney connected with the

mill, ready to run.

Q. Now, sir, if you have considered the subject of running that engine, please state what would be the cost of running the engine, introducing into it all the elements of expenses that you believe to belong to running an engine per annum; and in that confine yourself to ten hours of the day.

Interest on cost of plant, \$23,102, and depreciation, fifteen per \$3,465 Engineer, foremen and coal-passer, 3,057 1,000 Rent of engine, boiler and coal-house, 300 Oil, waste and packing, Insurance on engine, engine house, boiler house and coal 275 house, Fuel. 14,263 Taxes, 330 Repairs, 1,000 300 Supervision, Boiler insurance, 122

\$24,112 Total, Q. Now, if you are through with the details of that, go back in

your list to the item of fuel, and tell us, firstly, in making that estimate, how much fuel you have allowed per hour per horse-power? A. I have allowed four lbs. an hour for each horse-power, and

the number of horse-powers calculated upon was 320.

Q. Now, there is still an element that you have left, to my mind, uncertain, and that is the price of coal.

Mr. Butler. Is he an expert on that, too?
Mr. Hodges. He is an expert on what he allowed for that. He had some price for coal, or else he could not have arrived at anything but the amount of coal.

Mr. Butler. That is to say, he must have fixed the price?

Mr. Hodges. He fixed the price, and that is the only way we can test the accuracy of his calculations. That is my only purpose. I do not assume that he is an expert, — I don't believe anybody is, — on the price of coal.

A. I calculated the price of coal, for 2,240 pounds, put down

at Saxonville, at \$8.00.

Q. In making that estimate, it is based upon coal at \$8.00 a ton, of 2,240 pounds, put down at Saxonville?

A. Yes, sir, \$8.00 for 2,240 pounds.

- Q. Did you examine any other engine there than this one?
- A. No, sir.

Cross-examination.

- Q. (By Mr. Butler.) Did they show you what that engine did cost?
 - A. No, sir.
 - Q. Did they show you how much coal was burned?

A. No, sir.

Q. Did they show you the book of the daily consumption for three years?

A. No, sir.

Q. That is a Corliss engine, is it not?

A. It is, sir.

Q. Of the best construction, — is it, or isn't it? I don't care which.

A. Well, it is capable of working as economically —

- Q. I did not ask that question. Is that a Corliss engine of the best construction, or not?
- A. It is not a modern engine; it is not an engine such as Corliss has in the fair; it is an engine —
- Q. I did not ask that. Is it a Corliss engine of the best construction, as an article of commerce?

A. Well, I can answer that only by saying that it is capable of

doing as economical work as a Corliss engine is of to-day.

Q. It has the same method of connecting power by the flywheel and cogs that the engine in the fair has, hasn't it, — the cogs and fly-wheel operating on a jack?

A. With regard to the engine in the fair, I only know by—

Q. If you don't know anything about it, don't say anything about it, and then you won't mislead me. Tell only what you know; that will take quite as long as we want to delay. Do you now mean to tell the commissioners, sir, that a first-class Corliss engine, operated properly by a competent engineer, with good fuel, consumes four pounds of proper coal per hour per horse-power, in a 320 horse-power engine?

A. I mean to say, as I have said, that the variation in the con-

sumption of fuel -

Q. I have not asked that. Please answer my question. Do you mean to say that a first-class Corliss engine, properly operated by a competent engineer, fitted to produce 320 horse-power, will consume four pounds of coal per hour per horse-power?

A. I mean to say, as I have said, that is just about the average

that I find —

Q. I have not asked any average, because there may be very poor and very bad engines. I only want to know what amount of coal you think a first-class Corliss engine, properly run, capable of producing 320 horse-power, will consume?

A. A first-class Corliss engine, with selected coal, and that

picked, with a first-class, thorough fireman, trained to it, with an engineer who is a good jockey, will run a first-class Corliss engine of 320 horse-power, high pressure condensing, with two and a half pounds of coal. That is an exception, which I wish the gentlemen to understand is not carried out in factories.

Q. Have you ever bought or owned a first-class Corliss condens-

ing engine?

A. I never have owned a condensing engine. Q. Have you ever run one a week in your life?

A. No.

Q. Have you ever been in charge of any establishment a week in your life that did run one?

A. Yes, more than a week.

Q. How much more?

A. I think some fourteen days.

Q. I was unlucky in not setting it at a fortnight, instead of a week. I will trouble you with but one more question. How much do you get a day for your services as an expert from the Saxonville Company?

A. I have not made any contract with them, sir.

Q. How much do you charge a day?

A. That is rather going into a man's private business; but my charge is \$25 a day.

Q. How many days have you been about this work?

A. Well, two days anterior to yesterday — yesterday and today.

When did you make this examination?

- A. You already have that; September 4, I visited the works at Saxonville.
 - Q. You were there two days?A. No, sir.

Q. How long were you there?

A. About four hours.

Q. Did you ask to see the books to see how much coal was being used?

A. No, sir.

Q. How long is it since you ran an engine, even fourteen days? A. Well, the last of my engineering, as a runner of an engine, I left 1600 horse-powers -

Q. I do not ask any other information except the time.

A. 1852; — that is, as a runner of steam engines.

Q. How much did you include in this \$3,000 a year for the engineer?

A. I took the price that was given me by the superintendent.

Q. Well, you did ask, then, about the price of the engineer. How much did you take?—I don't care whether it was the price given you by the superintendent or not; - how much did you calculate for the engineer?

A. \$2.80 a day.

Q. More than one engineer? A. He was called the engineer.

Q. Did you take more than one engineer into your calculation?

A. No, sir.

A. How many firemen?

A. Two firemen.

Q. How many coal-passers?

A. One man and one horse and wagon.

Q. How much did you allow for the firemen?

A. Firemen, \$2 a day each.
Q. How much did you allow for the coal-passers?

A. Coal-passer and horse and wagon, \$3.

Q. How much for the one that hadn't the horse and wagon?

A. I did not find any such.

Q. Then you had only one coal-passer and a horse and wagon?

A. No, sir.

Q. How far had he to pass the coal?

A. I can't tell you, sir.

Q. And out of that you made \$3,000 a year?

A. Yes, sir, \$3,057.

Q. Now, sir, have you gone into any calculation to see how much that would make a horse-power cost there per year?

A. Yes, sir; \$75.35, according to my figures.

Q. Didn't you testify in the case of the water works of the town of Waltham?

A. Do these gentlemen want to know anything about that?

Q. I don't know whether they do or not; we will find out. Didn't you testify that the coal for a 100 horse-power engine, at \$8 a ton, cost \$50?

A. No, sir.

Q. Didn't you make that out as the amount finally?

A. No, sir; I testified to a fifty horse-power engine.

Q. At \$50 a horse-power?

A. No, sir.

Q. How much did you put that?

A. That was something over \$100. I don't exactly remember the figures; but, having stated that, I suppose I have a right to make an explanation why that came higher than this.

Q. I suppose the explanation is, that it costs less where you have a large power than it does where you have a small one. Isn't

that it?

A. That is part of the explanation.

Q. Didn't you start off with testifying that it would be \$150? Wasn't that your testimony, taken down by the reporter, that it would be \$150 a horse-power?

A. No, sir; I think not. Q. Sure, on your oath?

A. Well, the report will show. I think it was \$138; I am not sure.

GEORGE W. CLOUGH, sworn.

Q. (By Mr. Hodges.) What is your residence and occupation?

A. Saxonville; machinist and engineer.

Q. You know these Saxonville mills we are talking about? A. Yes, sir.

Q. How long have you known them?

A. About twenty years.

Q. Have you been engaged in them during that time?

A. Most of the time, with the exception of two and a half years.

Q. When was that? A. 1862, '3, and '4.

Q. What has been your business there?

A. Since 1860 I have run the engine; that is, the part of the time that it is run; the rest I have been in the machine-shop.

Q. Of course, excepting the time you have spoken of as being

absent from the works?

A. Yes, sir.

Q. When, if ever, did you begin to keep a record of the time when you run the engine by steam, and the days when the mill was run by water?

A. I think it was the 17th of June, 1871.

Q. Have you the original book in which you kept that time?

A. I have: it was the 17th of June, 1871.

Q. Had you, previously to that time, during the time since you took charge of the engine, kept any record of the time when the engine was run?

A. I had not.

Q. That is the first record you kept?

A. That is the first record.

Q. And that is a correct record of the times when it was run?

A. I think it is, unless there is some error of mine.

Q. You intended to keep it accurately?

A. Yes, sir.

Q. Is there another engine there besides the big Corliss engine that we have been speaking of?

A. Yes, sir. Q. Where is it?

A. It is connected with No. 1 mill — the large mill; it is between that and the machine-shop.

Q. As you pass down the hill?

A. Yes, sir; it is at the left as you go to the machine-shop.

Q. For what is that employed?A. There is no use for that now in particular.

Q. You don't use it?

A. We have not used it since we had this new engine.

Q. When was this new engine put in?

A. In 1860; in June, it was started up.

Q. Was the one that you have last spoken of, as being now unused, in the same place where this one is?

A. No, sir; there was another one in the place of this.

Q. Still another one in the place of this?

A. Yes, sir.

 \overline{Q} . Where is that other one? A. That has been broken up and sold for old iron.

Q. Do you know whether that was what was known as "the English engine"?

A. No, sir; the one that we have now, the disused engine, is the English engine. This other one was made in this country.

Q. Now, have you any knowledge of the amount of coal your engine demands?

A. I have not.

Q. Have you kept any memorandum of it, of any kind?

A. I have a memorandum of the coal that is used on the corporation; but not alone on the engine; that is, the amount of coal that we have used each day.

Q. How long have you kept that?

A. I commenced about the same time. I think June 17. Q. So that you have the amount of coal in the same book?

A. Yes, sir.

Q. What do these words mean on the book: "No. of loads per

day"?

A. That means one ton. In the first place, for one week, they weighed the amount of coal in the cart. We have to drag our coal from the railroad. It is probably twenty-five rods from the engine house, and they calculate a ton to a load. They weighed it for one week.

Q. (By Commissioner Russell.) How much for a ton?

A. 2,000 pounds.

Q. (By Mr. Hodges.) Take a day of ten hours: how much coal does your engine consume, when you use it, a day?

A. That I cannot tell you.

Q. Do you know anything of the cost of coal there?

A. No, sir.

Q. What coal do you use?

A. I cannot tell you that. I have nothing to do with the fire room. My business is in the engine room. Of course, I know whether it is hard or soft. It is hard coal.

Q. Passing from this matter, do you know the rapids below the dam? Have you observed them? What I want to get at is simply this, Mr. Clough: whether the fall of water beginning below your dam, until you come down to the level of the water, where it ceases to have a perceptible fall, — whether that is included within the limits of the Saxonville Corporation property, or whether the rapids extend below?

A. I don't know.
Q. You know the lower limits of the property there?

A. Yes, sir.

Q. Where is Elm street?

A. Elm street runs from up over the hill; runs from the depot up. [Pointed out on map.]

Cross-examination.

Q. (By Mr. Butler.) I only want to get at a few explanations. A load, then, means in this book a ton of coal drawn from the railroad to the coal-house at the engine room?

A. Fire room; yes, sir.

Q. And that load is supposed by you to represent 2,000 pounds of coal?

A. Yes, sir. Q. "No. of loads per day, No. 1 mill, on steam, June 17, 6," means that it took six tons per day to run No. 1 mill on the 17th of June?

A. No, sir; it didn't take all that coal to run that mill.

Q. That is exactly what I want to get at. I supposed it did

A. That is the amount of coal burned in the furnace.

Q. This book, then, shows the number of tons burned each day in the furnace?

A. Yes, sir.

Q. Then, on the 19th, you charged No. 2 mill on steam, and you burned four loads on that day?

A. Yes, sir.

Q. Then, where the blanks are, the engine stopped?

A. Yes, sir.

Q. But when the engine stopped, you burned three tons a day for four days?

A. Yes, sir.
Q. That was for heating purposes, I suppose?

A. Yes, sir. The next day was Sunday. You will notice Saturdays we burned a little more.

Q. Then, on Sunday, "20." What is that "20"?

- A. That is a summing up of the number of tons burned that week.
- Q. You haven't a book that shows the number of days the mill run, have you?
- A. Take that entry, for instance. There is No. 1 mill; there is No. 2 mill; but it is not carried out. I have another book for 1875.

Q. Have you any book with the amount of coal here?

A. No, sir; it is merely an account of the engine in a more condensed form than that book is — a mere copy.

Q. Was it kept day by day?

A. Yes, sir, every day.

Q. Then, on Sunday, you had burned during that week twenty tons of coal?

A. Yes, sir.

Q. You had run No. 1 on the 17th of June on steam one day.

Then the 18th was Sunday, and nothing was run. Then on the 19th the engine stopped half a day; so it ran half a day on the 19th. That is one day and a half. At noon you changed No. 2 to steam. Then, in the afternoon, the engine stopped, and you did not run it again until the 20th, so that where you burned twenty tons of coal that week, you only run the engine a day and a half?

A. Two days and a half.

Q. You run the engine two days and a half on one mill?

A. That is, No. 1 mill.

Q. I say on either one or the other, you run the engine two days and a half?

A. Yes, sir.

Q. Then, in burning twenty tons of coal that week you only had two days and a half of the engine on one mill. It takes about half your power on each mill for your engine, don't it?

A. No; it takes more on one mill than it does on the other

two - nearly one-half more, I think.

Q. When you run No. 1 mill, how many horse-powers does that take?

A. It is about 210, I think.

Q. How much does No. 2 take?

A. 92.

Q. There is no No. 3 now, is there?

A. No, sir.
Q. Then this shows all the mills run by steam?

A. Well, No. 2 includes No. 4 mill.

Q. You never make a separate account of No. 4?

A. No, sir.

Q. When No. 2 runs by steam No. 4 has to?

A. Yes, sir; and when No. 1 runs, No. 5 has to run by steam. Q. So that No. 1 and No. 5 go together, and No. 4 and No. 2 go together?

A. Yes, sir.

Q. Now, by going over this book carefully, we can tell just how long you run with steam each year, how many days in the year, and how many days you run partially with steam?

A. Yes, sir.

- Q. Have you ever gone over that calculation? A. I have, and have it here. [Paper produced.]
- Q. Where is 1871, sir? Have you got the calculation for 1871?

A: No, I did not commence until the first of January.

Q. Why didn't you commence in 1871, when your book commenced?

A. Well, it is on the paper, isn't it?

Q. That is in September. Your book commences in June, 1871. However, I won't bother you. We can make the calculation as well as you can, now we have got the date.

A. I thought I had it here; but I probably skipped those six

months.

Q. Well, in order to do that, we must have the other book, after we get over here, because you do not put in the mills.

A. There are no mills run I told you. I didn't make any

account of it when the mills didn't run.

Q. That is, wherever it is blank it was water-power? A. Yes, sir.

- Q. (By Commissioner Russell.) Then that book shows when the mills run by steam, and what mills run by steam, without the
- A. Yes, sir; the other book is merely a copy from that, only in This is the original book, and I coma little different form. menced it on my own account.

Q. (By Mr. Butler.) Isn't there a superintendent of these

mills at Saxonville?

A. Yes, sir; there is a superintendent and a paymaster.

Q. He ought to know how much coal he buys?

A. I don't think he buys the coal.

Q. He knows how much he receives and pays freight for, doesn't he?

A. I cannot tell you what he knows.

Q. The poor man has not died recently, has he?

A. No, sir.

Q. He might be here, if the company wanted him?

A. Yes, sir.

Q. I want to ask you a question or two about another matter, seeing that you are the last gentleman I am likely to get from those mills. Do you know anything about what that dam cost?

A. No, sir; it was built long before I went there.

Q. Did you ever run your mill when the heating apparatus was not going?

A. No, sir; they both have to run at the same time.

Q. Is yours a good engine?

A. Yes, sir.

Q. And your pay is how much?

A. \$2.52 a day.

Q. How long has it been that?

A. Since the first of September, 1876.

Q. Then, if the superintendent told Mr. Bacon on the 4th of September it was \$2.80, somebody got it wrong, didn't they? You would be glad to have the \$2.80, I suppose?

A. I would, yes, sir. They cut down the first of September

from 2.80, ten per cent.

Q. (By Mr. Hodges.) It was \$2.80 until the first of the month?

A. Yes, sir.

Q. (By Mr. Butler.) How much do the firemen get a day?

A. Two dollars.

Q. Since the cut down?

A. No, sir; ten per cent. off.

Q. We want to get at what they are paying now, because we suppose it is going still lower. How much does the man with the horse and wagon get?

A. I don't know what he gets.

Q. He has to haul seven or eight tons of coal a day, doesn't he?

A. Yes, sir.

Q. About how many rods?

A. I should say it was twenty or twenty-five rods.

Q. Do you think it costs three dollars a day to haul seven or eight tons of coal twenty-five rods?

A. I should say not; no, sir.

Q. Have you ever kept an account of how much it cost you for oil and waste?

A. No, sir.

- Q. How much should you say it does cost to move coal from the railroad depot, or the place where it is deposited to your coal house?
- A. I have no idea of knowing. I don't know what it costs to keep the horse, or how much the man gets.

Q. Don't that man and horse do anything else?

A. Yes, sir.

Q. When your engine is not running, you are engaged on its repairs, or engaged as machinist in the repair-shop?

A. Yes, sir. Q. When the engine is not running, the firemen are engaged in keeping up the fire under the boiler for heating?

A. One of them; the other one is engaged elsewhere most of

the time.

Q. Do you keep an account of the repairs on the engine?

A. No, sir.

- Q. Does anybody do any repairs on the engine besides yourself?
- A. If I have a job, if I want any assistance, I have it from the machine-shop.

Q. I know; but as a rule?

A. Yes, sir; sometimes I have from one to ten men; it depends upon the job.

Q. Give me your very best estimate for the year past, of the

repairs upon your engine.

A. It would be merely guess-work. I have no idea. Repairs count up pretty high.

Q. You drive your engine about how many times a minute?

A. Fifty-two.

Q. Its capacity is what?

A. Well, it is tested 320 horse-power. That is the most I have ever made it; — that amount of machinery.

Q. Does your engine when it is running by steam run as well

as it does when it is running under water?

A. Yes, sir; it runs as well. What do you mean by "running as well "?

Q. As steadily, as easily?

A. Yes, sir.

Q. Does your engine labor at all at any time with the amount of work that is put upon it?

A. Yes, sir; it has.

Q. When?

A. Previous to putting on the condenser.

Q. How long has the condenser been on?

A. Three years, I think.

Q. That has increased its capacity somewhat?

A. Yes, sir.

Q. Or rather, perhaps, increased its steadiness. Is that it?

A. Well, it has taken off a certain per cent. of power. That is, the engine runs easier.

Re-direct.

Q. (By Mr. Hodges.) You say your engine rates 320 horse-power: will it perform no higher duty than that?

A. Yes, sir. I presume it would perform duty until it breaks,

as far as that is concerned.

Q. When you say it rates at that, I don't think I quite understand you. Do you know that it never has performed higher duty than that?

A. That is the highest of any card that has ever been taken from it

Q. It may have performed a higher duty without the card being taken?

A. Yes, sir.

Q. How often are cards taken?

A. No specific time. Sometimes I take a dozen a day, and then I may not take one for a week.

Q. Is it your habit to take them oftener than once a week, or

have you any habit about it?

A. No, sir. I have no habit. If there is anything the matter, if the valves don't seem to work right, I put on the indicator.

Q. Sometimes it is not on for a month?

A. Yes, sir. It has not been on this month.

Q. Will you take this book and tell me from that how many days No. 1 worked by steam in June, 1871?

A. Two days and a half. Q. How much No. 2?

A. Two days and a half.

Mr. BUTLER. Then we have the mills running by steam two days and a half in June?

Mr. Hodges. Yes, sir.

Re-cross.

Q. (By Mr. Butler.) Mr. Engineer, a 320 horse-power engine can be run up, without any trouble, from twenty to twenty-five horse-power more, can it not?

A. This engine, I would say, was tested 250 horse-power.

Q. I want you to explain a little discrepancy to me, if you can. Assume that you find that your indicator shows 320 horse-power, (that is the highest, it is assumed; that is in the testimony, and I will leave it); that it takes twenty per cent. of that power to turn the shafting and transmit it to the machinery; assume that the machinery is in itself accurately tested and found to be 325 horse-power, how can that be done, if it can be done?

· A. I don't know, unless you take the twenty per cent. from it.

The friction.

Q. Pardon me; you don't quite apprehend me. I only wanted to call your attention, whether your engine really did not run You say you got 320 as the highest indicator?

A. Yes, sir; that is the card from the cylinder.

Q. Now, then, that is the highest amount of power that is transmitted from the engine?

A. Yes, sir.

Q. Very well. Now, it takes ten per cent. of that 320 horsepower, to wit, 32 horse-power, to turn the shafting and connections; but yet the dynamometer is supposed to show that the machinery itself requires 325 horse-power to run it. Can you explain how that can be? You start with 320.

A. 314, I think it was.

Q. Well, 314. Assume it is 314. Are you not just as badly off?

A. No, sir, I cannot explain that.

Mr. Butler. You and I are exactly alike in that. I cannot explain it. I didn't know but somebody could.

Mr. Hodges. There is where you both differ from me. Mr. Butler. Oh! you can. I am glad of that.

Q. Now, in this sheet for 1871, you have put down no days of steam. You have just told us that each of the mills run two and a half days.

A. I commenced taking this report the 17th day of June.

that reason, I have no report previous to July, 1871.

- Q. But in the book that you have, there seems to be two and a half days for mill No. 1, and two and a half days for mill No. 2 in June?
 - A. Yes, sir. I didn't take it, for this was a broken month.

Q. (By Commissioner Russell.) There might have been other days when steam was used in June, before the 17th?

A. Yes, sir. I will say that when I commenced to take these books, I never had any idea that they would go before any court.

Q. You did it on your own account?

A. Yes, sir.

Table showing the number of days of the use of steam and amount of coal consumed at Saxonville Mills, from June 17, 1871, to Dec. 31, 1874.

1871.	No. of loads per da	ay.		1871.	No. of loads per day.
June 17	No. 1 mill on steam	6		July 1	No. 2 steam 5
18	Sunday			2	Sunday 33
19	Engine stopped & day			3	No. 1 & 2 6
	M., changed No. 2			4	
	steam. P. M., engine			5	No. 1 6
	stopped	4		6	" 6
20	***************************************	3		7	No. 1½ & 2 7
21		3		8	7
22		3		9	Sunday 32
23		3		10	No. 1½ & 2 8
24 •	No. 2½	4		11	"
25	Sunday	20		12	" 8
26	M	3		13	" 7
27	Changed 2, on steam	6	2	14	" 7
28	No. 2 "	5	2	15	" 6
29	1 steam	6		16	Sunday 44
30	1 "	8		17	No. 1 & 2½ 7

July 18 No. 1 and 2½ steam 7 20 " 8 20 " 7 21 " 8 22 " 7 21 " 8 22 Sunday 43 24 No. 1 & 2 8 25 " 8 25 26 " 5 26 27 " 8 25 No. 1 and 2 8 28 " 6 30 Wilder 8 29 " 8 29 " 6 30 Wilder 8 29 " 8 29 " 6 30 " 9 8 29 " 6 30 " 9 8 29 " 6 30 " 9 8 29 " 6 2 No. 1 and 2 7 40 1.1	1871.	No. of loads per day.	1871. No. of loads per day.
20			(Cattle show
21		••••	
223 Sunday 43 23 " 77 24 No. 1 & 2 & 8 24 Sunday 38 25 " 8			
23 Sunday 43 23 " 7 24 No. 1 & 2 8 24 Sunday 38 25 " 8 25 No. 1 and 2 8 26 " 5 26 " 8 27 " 8 27 " 7 28 " 8 29 " 8 29 " 6 6 30 " 9 30 Sunday 43 Oct. 1 Sunday 47 31 No. 14 steam and 2 7 4 " 7 3 No. 1 1 4 2 5 6 " 4 " 4 No. 1 2 steam 2 7 4 " 7 3 No. 1 1 4 2 5 6 " 4 " 7 3 No. 1 1 4 2 5 6 " 4 " 7 3 No. 1 1 4 2 5 6 6 " 4 8 4 No. 1 2 steam 8 7 No. 1 and 2 4 8 5 " 1 4 2 " 6 8 Sunday 45 6 Sunday 39 No. 1 and 2 7 7 No. 1 2 2 2 8 8 10 " " 5 13 Nos. 1 2 1 4 11 " 1 2 " 6 14 6 12 " 1 4 2 " 6 15 13 Sunday 39 38 16 No. 2 4 6 14 1 2 2 7 17 No. 1 7 15 1 2 2 7 18 " 7 16 1 2 2 7 20 " 7 17 1 2 2 8 21 " 7 18 1 2 2 8 21 " 7 21 1 2 2 7 20 " 7 22 1 2 2 8 21 " 7 23 1 2 2 7 20 " 7 24 1 2 2 7 20 " 7 25 1 2 2 8 21 " 7 26 1 2 2 7 20 " 7 27 1 2 2 8 21 " 7 28 1 2 2 7 24 " 7 29 1 2 2 7 20 " 7 21 3 2 2 7 20 " 7 22 1 2 2 7 20 " 7 23 1 2 2 7 20 " 7 24 1 2 2 7 20 " 7 25 1 2 2 7 20 " 7 26 1 2 2 7 20 " 7 27 18 1 2 2 7 20 " 7 28 1 2 2 7 20 " 7 29 1 2 2 7 20 " 7 20 1 2 2 7 20 " 7 21 3 3 3 3 3 3 3 3 3		**** 0	
24 No. 1 & 2		quarter. o	
26			
27		••••••	25 No. 1 and 2 8
28			40
29		••••••	41
30 Sunday		***************************************	20 **********
31 No. 1½ steam, 2			
Aug. 1 No. 1 steam and 2	31		2 No. 1 and 2 7
2 No. 1 steam \(\frac{1}{2} \) 2 No. 1 steam \(\frac{1}{2} \) 2 . 5	4 7		0
3 No. 1 " ½ 2. 5 6 " 8 8 4 No. 1 & 2 steam. 8 6 7 No. 1 and 2½ 8 8 5 " ½ 2" 6 8 Sunday. 45 6 Sunday. 39 9 No. 1 and 2½ 77 7 No. 1 & 2 steam. 6 10 " 77 8 " " " 7 7 11 No. 1 79 9 " ½ 2 " 8 12 " 6 10 " 6 10 " 77 9 " ½ 2 " 8 12 " 6 14 6 10 " 77 11 " 1 & 2 " 6 14 6 14 6 12 " 1½ & 2 " 6 14 6 12 " 1½ & 2 " 6 14 6 12 " 1½ & 2 " 6 14 6 15 Sunday. 39 13 Sunday. 38 16 No. 2¾ 6 6 14 1 8 " 77 15 1 & 2 2 7 7 17 No. 1 7 7 15 1 & 2 2 7 7 18 " 77 16 1 & 2 2 7 7 18 " 77 17 1 & 2½ 7 7 19 " 77 18 1 & 2 2 8 12 " 77 19 1 & 2 2 8 8 21 " 77 19 1 & 2 2 8 8 21 " 77 19 1 & 2 2 8 8 21 " 77 22 1 & 2 2 8 8 21 " 77 23 1 & 2 2 8 8 21 " 77 24 1 & 2 2 7 7 26 No. 1 and 2½ 8 8 21 1 & 77 24 1 & 2 2 8 8 25 " 77 25 1 & 2 2 8 8 25 " 77 26 1 & 2 ½ 7 7 26 No. 1 and 2½ 8 8 25 " 77 27 18 1 & 2 2 8 8 25 " 77 28 1 & 2 2 8 8 25 " 77 29 1 & 2 2 8 8 25 " 77 20 1 & 2 2 8 8 25 " 77 20 1 & 2 2 8 8 25 " 77 20 1 & 2 2 8 8 25 " 77 20 1 & 2 2 8 8 25 " 77 20 1 & 2 2 8 8 26 " 77 20 1 &			1
4 No. 1 & 2 steam. 8 7 No. 1 and 2½. 8 5 " 1½ & 2" 6 8 Sunday. 45 6 Sunday. 39 9 No. 1 and 2 7 7 No. 1 & 2 steam. 6 10 " 7 8 " " 7 11 No. 1 7 9 " ½ & 2" 8 12 " 6 10 " " 5 13 No. 1½ and 2½ 6 11 " 1½ & 2" 6 14 4 6 6 12 " 1½ & 2" 6 15 Sunday 39 13 Sunday 38 16 No. 1½ and 2½ 6 14 1 & 2 " 6 15 Sunday 39 13 Sunday 38 16 No. 1½ 8 14 1 & 2½ 7 19 " 7 15 1 & 2	_		
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7 No. 1 & 2 steam. 6 10			
8 " " 7 11 No. 1. 7 9 " 1½ & 2 " 8 12 " 6 6 10 "" " 5 13 Nos. 1½ and 2½ 66 11 " 1½ & 2 " 6 14 66 12 " 1½ & 2 " 6 14 6 13 Sunday 38 16 No. 2¾ 6 6 14 1 & 2½ 7 7 17 No. 1 7 15 1 & 2 7 18 " 7 16 1 & 2 7 19 " 7 17 1 & 2½ 7 7 20 " 7 18 1 & 2 7 20 " 7 18 1 & 2 8 21 " 7 19 1 & 2 8 21 " 7 19 1 & 2 8 21 " 7 20 Sunday 42 23 No. 1 and 2½ 8 21 1 & 2 7 24 " 7 22 1 & 2 8 25 " 7 23 1 & 2 7 26 No. 1 7 24 1 & 2 7 27 No. 1 and 2½ 8 25 1 & 2 7 29 Sunday 44 27 Sunday 44 30 No. 1 8 28 1 & 2½ 7 7 29 1 & 2 7 29 Sunday 44 28 1 & 2½ 7 7 30 1 & 2 7 29 Sunday 44 28 1 & 2½ 7 7 30 1 & 2 7 29 Sunday 44 28 1 & 2½ 7 7 30 1 & 2 7 29 Sunday 44 28 1 & 2½ 7 7 30 1 & 2 7 29 Sunday 44 29 Sunday 44 30 No. 1 8 Sept. 1 No. 1 mill on steam 6 2 " 2 " 4 Sunday 47 3 Sunday 37 6 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 5 " 1 & 2 7 No. 1 and 2½ 9 7 No. 1 and 2 9 5 " 1 & 2 8 No. 1			
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17 Sunday 44 20			
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	18	Nos. 1 and $2\frac{1}{2}$	21 4
19 Nos. 1 and 2 6 22 4	19	Nos. 1 and 2 6	22 4

SAXONVILLE MILLS.

1871.	No. of loads per day.	1872.	No. of loads per day.
Nov. 23		Jan. 25	No. 2½ 8
24		26	" 2 9
25	5	27	· · 2 · · · · · · 9
26	•	28	Sunday 45
27	6	29	No. 2 10
28 29	9	30 31	" $1\frac{1}{2} \& 2\frac{1}{2} \dots 9$ " $1 \dots 10$
30		Feb. 1	No. 1 10
Dec. 1	10	2	" 1 19
2		3	" 1 14
3	Sunday 44	4	Sunday62
4 5	No. 2 5	5 6	No. 1 10 "1 10 "10 "10 "10 "10 "10 "10 "10 "1
6	" 9	7	" 1 14
7	No. 1 10	8	" 1 12
8	No. 2 8	9	" 2 9
9	" 10	10	" 2 · · · · · · 10
10 11	Sunday 52 No. 2 8	11 12	Sunday
12	" 8	13	" 1 10
13	No. $1\frac{1}{2}$ and $2\frac{1}{2}$ 8	14	$1\frac{1}{2}$
14	No. 1 10	15	Put in Chub and Brick's Packing. 8
16	Nos. $1\frac{1}{2}$ and $2\frac{1}{2}$	16	8
17 18	Sunday 57 No. 2 9	17	
19	" 9	19	No. 2½ 8
20	No. $1\frac{1}{2}$ and $2\frac{1}{2}$ 10	20	" 2 9
21	No. 1	21	" 2 8
22 23	" ····· 10 " ···· 17	22 23	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
$\begin{array}{c} 23 \\ 24 \end{array}$	"	24	" 2 · · · · · · · · 10 · · · 9
25	Christmas	25	Sunday 52
26		26	6
$\begin{array}{c} 27 \\ 28 \end{array}$	5	27 28	No. 2\frac{3}{4} \cdots \cdots 10
29	9	29	No. $1\frac{1}{2}$ & $2\frac{1}{2}$ 8
30		Mrch. 1	No. 1 10
31	Sunday 33	-2	No. $1\frac{1}{2}$ & $2\frac{1}{3}$ 10
1872.		3	Sunday 54
Jan. 1	7	5	No. 2 11
3		6	No. 1 & 2½
4	6	7	" 1 & 2 10
5	6	8	
6 7	Sunday 10	9 10	No. 1
8	8	11	Sunday 78
9	8	12	6
10	No. $2\frac{1}{2}$ 7	13	8
11	" 2 7 " 2 9	14	No 2½ 9
12 13	" 2 9 10	15 16	7
14	Sunday 49	17	Sunday 44
15	No. $2\frac{1}{2}$ 9	18	9
16	" 2 8	19	No. 1 & 2\frac{3}{4} \cdots \cdots 12
17	" 1 10	20	$1\frac{1}{2} \& 2 \dots 11$
18 19	" $1_1 \& 2_2 \dots 10$ " 7	$\begin{array}{c c} 21 \\ 22 \end{array}$	No. 2 12
20		23	" 2 10
21	Sunday 51	24	Sunday 64
22		25	No. 2 11
23	7	26	" 2 8 " 2 6
24	7	27	2 6

4070	NT	1 1070	NT
1872.	No. of loads per day.	1872.	No. of loads per day.
Mar. 28	No. 2 7	May 30 31	Decoration Day
30	" 2 9	June 1	
31	Sunday 49	2	Sunday 18
Apr. 1	No. 2 8	3	4
2	" 2 11	4	No. 2 4
3	" 2 11	5	
4	Fast Day	6	
5	No. 2 8	7	
6	" 8	8	3 Cundom 10
7 8	Sunday 46 No. 2 8	9 10	Sunday 19
9	" 7	11	
10	" 6	12	3
11	" 6	13	4
12	" 9	14	No. 2 5
13	" 6	15	23 3
14	Sunday 42	16	Sunday 20
15	No. 2 6	17	No. 2½ 5
16 17	" 6	18 19	No. $1\frac{1}{2} \& 2\frac{1}{2}$
18	"	20	No. 1 & 2\frac{1}{4}
19	" 4	21	" 6
20	" 5	22	" 5
21	Sunday 32	23	Sunday 36
22	No. $2\frac{1}{2}$ 6	24	No. 1 6
23	4	25	No. 1 & 2\frac{1}{4}
24	4	26	No. 1 & 2 9
$\begin{array}{c} 25 \\ 26 \end{array}$	4	27 28	No. 1 & 2 8
20 27		29	10.1 & 2
28	Sunday 25	30	Sunday 41
29	3	July 1	No. 1 & 2 6
30	3	2	" 9
May 1	4	3	5
2	4	4	July 4th
3	$\frac{4}{2}$	5 6	No. 1 & 2 6
4 5	Sunday 20	7	"
6	5unday	8	No. 1 & 2
7		9	" 7
8	5	10	" 7
9	3	11	" 7
10		12	
11	0	13	" 7
12 13	Sunday 16	14 15	Sunday 42 No. 1 & 2 5
14	No. 2 5	16	"
15		17	" 7
16		18	" 7
17		19	" 7
18		20	" 5
19	Sunday 28	21	Sunday 38
20 21		22 23	No. 1 & 2 6
21	N_0 . $1\frac{1}{2}$ & $2\frac{1}{2}$	25 24	· · · · · · · · · · · · · · · · · · ·
23		25	"
24		26	7
25		27	" 7
26	Sunday 27	28	Sunday 41
27	3	29	No. 1 & 2 7
28	No. 2 6	30	No. 1 and 2 7
29	3	31	7

1872.	No. of loads per day.	1872.	No. of loads per day.
Aug. 1	No. 1 and 2 7	Oct. 3	3
2	" 7	4	5
3	6	5	3
4	Sunday 41	6	Sunday 15
5	No. 1 and 2 7	7	No. $2\frac{1}{2}$ 3
6	" 7	8	3
7	" 7	9	2
8	No. 1 7	10	4
9	No. 1 and 2 7	11	3
10	" 7	12	4
11	Sunday 42	13	Sunday 19
12	No. 1 and 2 6	14	3
13	" 7	15	4
14	" 7	16	4
15	" 7	17	4
16	" 7	18	
17	5	19	3
18	Sunday 39	20	Sunday 22
19	2	21	3
20	3	22	No. $2\frac{1}{2}$
21		23	No. 2 6
22	2	24	4
23	3	25	No. 2½ 4
24	2	26	3
25	Sunday 15	27	Sunday 23
26	N_0 . $2\frac{1}{2}$	28	6
27	No. 2 4	29	4
28	No. 1 and $2\frac{1}{2}$	30	2
29	No. 1 and 2 7	31	4
30	No. $1\frac{1}{4}$ and 2	Nov. 1	4
31	No. 2 3	2	
Sept. 1	Sunday 30	3	Sunday 25
2		4	4
3	No. 2½ 4	5	4
4	No. 2½ 4	6	
5	No. 2 3	7	4
6	No. $1\frac{1}{2}$ and $2\frac{1}{2}$ 5	8	4
7	No. 1 7	. 9	
. 8	Sunday 25	10	Sunday 23
9	No. 1 5	11	4
10	No. 1 and 2 7	12	4
11	" ······· 7	13	4
12	8	14	4
13	"	15	4
14	No. 1½ 7	16	
15	Sunday 41	17	Sunday 25
16	3	18	5unday 6
17	4	19	
18	Cattle Show 0	20	
19	cattle Show 3	20	
20	4	21	
20		23	
22		23 24	
23	Sunday		
	$N_0, 2\frac{1}{2}, \dots, 3$	25	
$\frac{24}{25}$	3	26	4
		27	Thenkraining
26	3	28	Thanksgiving
27	3	29	
28	S 3	30	2¾
29	Sunday 18	Dec. 1	2 dans day
30 Oot 1	3	2	9
Oct. 1	3	3	6
2	1	4	7

*0#0	Mr. of leads now down	1070	No. of loads non-do-
1872.	No. of loads per day.	1873.	No. of loads per day.
Dec. 5	6	Feb. 5	•••••• 9
6	6	6	6
7	4	7	6
8	Sunday 38	8	9
9	5	9	Sunday 44
10	No. $2\frac{1}{2}$	10	
11	No. 2 10	11	11
12	" 10	12	No. $2\frac{1}{4}$ 8
13	" 8	13	6
14	" 9	14	8
15	Sunday 55	15	9
16	No. 2 8	16	Sunday 47
17	" 8	17	8
18	" 7	18	No. 2 7
19	" 8	19	" 8
20	" 8	20	7
21	" 10	21	9
22	Sunday 49	22	No. 2 12
23	No. 2 12	23	Sunday 51
24	"	24	
25	Christmas	25	No. 2 10
26	No. 2 11	26	" 9
27	"	27	8
28	No. 1	28	5
29	Sunday 66	March 1	7
30	No. 1	2	Sunday
31	" 1	3	5
91	1	4	7
1873.		5	
	Nr. 0		
Jan. 1	No. 2 8	$\frac{6}{7}$	No. 2½ 9
2		7	9
3	•••••••	8	Sundan
4		9	Sunday 47
5	Sunday 55	10	8
6		11	6
7	9	12	6
8	11	13	4
9	6	14	6
10	9	15	6
11	6	16	Sunday 36
12	Sunday 47	17	8
13	10	18	8
14	9	19	6
15	6	20	6
16	8	21	
17	8	22	6
18	6	23	Sunday 35
19	Sunday 47	24	7
20	8	25	
21	8	26	5
22	6	27	6
23	6	28	7
24	8	29	6
25		30	Sunday 38
26	Sunday 46	31	5
27	7	Apr. 1	4
28	8	2	5
29	10	3	Fast Day 0
31	7	4	7
F eb. 1	8	5	8
2	Sunday	6	Sunday 29
3	8	7	4
4	6	8	4

1873.	No. of loads per day.	1873.	No. of loads per day.
Apr. 9	4	Juue 11	No. 1 and 2 9
10	4	12	No. 1 and $2\frac{1}{2}$ 8
11	4	13	No. 1 6
12	7	14	" 5
13	Sunday 27	15	Sunday 40
14	3	16	No. 1 6
15	4	17	" 6
16	4	18	No. 1 and $2\frac{3}{4}$ 9
17	4	19	No. 1 and 2 8
18	4	20	7
19	· · · · · · · · · · · · · · · · · · ·	21	No. 1 and $1\frac{1}{2}$ 6
20	Sunday 26	22	Sunday 42
21	4	23	No. 1 and 2 9
$\frac{21}{22}$	4	24	" 8
23	4	25	" 7
24	4	26	" 7
25	4	27	" 7
26		28	
27		29	*************
28			Sunday 45
28		30	No. 1 and 2 8
	3	July 1	**********
30	3	2	
May 1	3	3	No. 1 MS 2 8
2	3	4	Fourth
3	6	5	No. 1 MS 2 6
4	Sunday 21	6	Sunday 38
5	3	7	No. 1 MS 2 8
6	3	8	7
7	9	9	" 7
8	2	10	" 6
9		11	" 6
10	5	12	" 7
11	Sunday 25	13	Sunday 41
12	No. $1\frac{1}{2}$ 7	14	No. 1 MS 2 7
13	No. 1 6	15	·· 9
14	" 8	16	" 7
15	" 7	17	" 9
16	" 5	18	" 9
17	" 6	19	No. 1 MS 5
18	Sunday 39	20	Sunday 48
19	4	21	No. 1 MS 7
20	4	22	" 7
21	No. 23 5	23	No. 1 MS 2 7
22	No. 2 5	24	No. 1 MS 6
23	" 4	25	No. 1 MS 2 7
24	" 6	26	" · · · · · · · · · · · · · · · · · · ·
25	Sunday 28	27	Sunday 41
26	5unuay 4	28	No. 1 MS 2 7
27	4	29	" 8
28		30	" 10
29			" 7
30		31	
31	Decoration Day 0	Aug. 1	No. 1 MS 2 9
91	2	_	
Tues - C		3	Sunday
June 2	N 0	4	No. 1 MS 2 9
3	No. 2 6	5	" 9
4	6	6	
5	No. 1 5	7	No. $1\frac{1}{2}$ MS $2\frac{1}{2}$
6	No. 1 and $2\frac{1}{2}$ 8	8	No. 1 MS 2 9
7	No. 1 7	9	
8	Sunday 34	10	Sunday 49
9	No. 1 6	11	No. 1 MS 2 7
10	No. 2 6	12	" 9

1873.	No. of loads per day.	1873.	No. of loads per day.
Aug.13	No. 1 MS 2 7	Oct. 15	No 1 7
14	7	16	No. 1 & 2 8
15	" 9	17	" 8
16	6	18	9
17	Sunday 45	19	Sunday 44
18 19	No. 1 MS 2 6 No. $1\frac{1}{2}$ MS $2\frac{1}{2}$ 6	$\frac{20}{21}$	No. 1 & $2\frac{1}{2}$ 4
20	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	22	4
21		23	3
22	2	24	5
23	2	25	3
24	Sunday 22	26	Sunday 26
25 26	3	27 28	4
27	No. 2 4	29	4
28	No. $1\frac{1}{2}$ and $2\frac{1}{2}$ 8	30	4
29	No. 1 7	31	6
30	" 7	Nov. 1	1 1
31	Sunday 32	2	Sunday 24
Sept. 1	No. 1 6	3	
3	" 7	4 5	No. 2\frac{3}{4} \cdots \cdots 7 \\ \frac{1}{1} \cdots \cdots \cdots 8
4	"	6	No. 1 & 2 10
5	" 6	7	" $1 \& 2\frac{1}{4}$ 11
6	" 5	8	5
7	Sunday 38	9	Sunday 46
8	No. 1 6	10	9
9	", 7	11 12	
11	No. 1 and 2 9	13	Cut down 20 per cent. 5
12	" 7	14	All hands stopped work
13	7	15	Commenced work with
14	Sunday 43		10 per cent. off 10
15	No. 1 and 2 9	16	Sunday 35
16 17	Cattle Show 9	17 18	····· 9
18	No. 1 and 2 8	19	No. 2 9
19	No. 1 MS 2 9	20	" 10
20	No. 1 and 2 8	21	6
21	Sunday 43	22	
22	No. 1 and 2 9	23	Sunday 48
23 24	" 8	$\begin{array}{c} 24 \\ 25 \end{array}$	7
25		26	
26	" 8	27	Thanksgiving
27	" … 7	28	5
28	Sunday 46	29	
29	No. 1 and 2 8	30	Sunday 49
30 Oct. 1	" 8	Dec. 1	8
2	"	$\frac{2}{3}$	No 2½ 8
3	" 7	$\frac{3}{4}$	
4	" … 7	5	6
5	Sunday 46	6	10
6	No. 1 and 2 8	7	Sunday 42
7 8	No. 1 & 2½ 7	8 9	No. 13 & 23 8
9	3	10	5
10	5	11	5
11	3	12	5
12	Sunday 31	13	
13	No 2 5	14	Sunday 41
14	" 7	15	4

1873. No. of loads per day	No. of loads per day.
Dec. 16 8	Feb. 17 8
17 6	18 7
18 7	19 6
19 7	$20 \dots 5$
20 No. $1\frac{1}{2} & 2\frac{1}{2} \dots 14$	21 8
21 Sunday 46 22 5	22 Sunday 42 23 5
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
24	$25 \cdots 7$
25 Christmas	26 8
26 8	27 7
27 No. $1\frac{1}{2} \& 2\frac{1}{2}$	28
28 Sunday 41	Mch. 1 Sunday
29 9	2 9
30 8	3 3
31 9	4 7
Jan. 1, 1874 4	5 6
2 7	6 7
3	7 7
4 Sunday 44	8 Sunday 39
5 7	9 4
6 7	10 8
7 7 8 No. $1\frac{1}{2}$ and $2\frac{1}{2}$ 9	11 8 6
8 No. 1½ and 2½ 9 9 4	12 6 13 8
10 5	14
11 Sunday 38	15 Sunday 46
12 6	16
13 4	17 6
14 8	18 3
15 9	19 6
16 4	20 6
17 7	21 8
18 Sunday 38	22 Sunday 35
19 7	23 7
20 7	24 8
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	25 6
22 6 23 5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
24 7	28
25 Sunday 38	29 Sunday 40
26	309
27)	31 4
28 (Ten tons soft coal) 3	April 1 8
29 burned. 8	2 Fast day
30]	3 4
31 12	4
Feb. 1 Sunday	5 Sunday 36
2 9	6 7
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	7 6
4 No. 2½ 9 5 8	8 7
6	10 5
711	11 6
8 Sunday 54	12 Sunday 37
9 7	13 8
10) (5	14 5
11 (Ten tons soft coal) 3	15 3
12 burned.	16 5
13) 5	17 3
14 9	18 8
15 Sunday 32	
16 7	20 4

1874.	No. of loads per day.	1874.	No. of loads per day.
Ap. 21	4	June 24	•••••••••••••••••
22	4	25	5
$\begin{array}{c} 23 \\ 24 \end{array}$	8	$\frac{26}{27}$	No. 1 and 2 8
25	4	28	Sunday 24
$\frac{1}{26}$	Sunday 30	29	No. 1 and 2 6
27	6	30	8
28 29	4	July 1	
30	5	3	No. 1 and 2 MS 8
May 1		4	July Fourth.
2	<u>4</u>	5	Sunday 25
$\frac{3}{4}$	Sunday 32	$\begin{bmatrix} 6 \\ 7 \end{bmatrix}$	No. 1 and 2 8
5	5	8	No. 1 6
6	9	9	" 6
7		10	" 9
8 9	5	11 12	No. 1 and 2
10	Sunday 28	13	No. 1½ 6
11	3	14	" 5
12	4	15	No. 1 5
13 14		16	No. 1 and 2
15	4	18	No. 1 7
16	5	19	Sunday 41
17 18	Sunday 23	$\begin{array}{c} 20 \\ 21 \end{array}$	No. 1 7
19	4	22	No. 1 and 2 8
20		23	" 7
21		24	"
$\begin{array}{c} 22 \\ 23 \end{array}$	4	25 26	Sunday 46
$\frac{26}{24}$	Sunday 21	27	No. 1 and 2 8
25	5	28	" 6
26	3	29	8
27 28	4	30 31	" 9
29	3	Aug. 1	" 7
30	Decoration Day.	2	Sunday 46
June 1	Sunday 19	3 4	No. 1 and 2 7
2	5	5	No. 1 MS and 2 7
3	5	6	No. 1 and 2 7
4		7	8
5 6		8 9	" 8 Sunday 44
7	Sunday 20	10	No. 2 4
8	5	11	6
9	4	12	" 4
11	4	13 14	No. 1 MS 6
12	4	15	2
13	G 1	16	Sunday 28 No. 1 MS 7
14 15	Sunday 23	17 18	No. 1 MS 7 No. 2 6
16	4	19	No. $1\frac{1}{2}$ and $2\frac{1}{2}$ 7
17	5	20	No. 1 MS 6
18	4	$\begin{array}{c} 21 \\ 22 \end{array}$	" 6
19 20		22 23	Sunday 36
21	Sunday 24	24	4
22	3	25	1 M. S 9
23		26	1 M. S. 2 8

1874.	No. of loads per day.	1874.	No. of loads per day.
Aug. 27	1 M. S	Oct. 30	No. 1 M. S. 2 9
28	No. $1\frac{1}{2}$ 5	31	********
29	No. 1 & $2\frac{1}{2}$ 7	Nov. 1	Sunday
30	Sunday 40	2	No. 1 M. S. 2 7
31	Nos. 1 & 2 8	3	" 9
Sept. 1	" 9	4	" 10
2		5	" 9

3	No. $1\frac{1}{2} \& 2\frac{1}{2}$	6	
4	No. 1 & 2 7	7	No. 1 M. S 8
5	1 M. S. 2 7	8	Sunday 51
6	Sunday 44	9	No. 1 M. S. 2 9
7	1 M. S. 2 7	10	No. 1 M. S 7
8	7	11	" 8
9		12	
	***************************************		••••••
10	***************************************	13	******* 10
11	" 8	14	No. 1 M. S. 2 10
12	" 7	15	Sunday 53
13	Sunday 43	16	No. 1 & M. S 12
14	1 M. S. 2 9	17	No. 1 M. S. 23 9
15	" … 7	18	" 2½ 7
16	***************************************	19	No. 1 M. S. 2 10
17	***************************************	20	" 10
18	" 8	21	" 10
19	1 M. S 7	22	Sunday 58
20	Sunday 46	23	No. 1 M. S. 2 10
21	1 M. S 7	24	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
22		25	
23	Cattle Show	26	Thanksgiving
24	1 M. S. 2 7	27	No. 1 8
25	" 8	28	No. 1 & 2\frac{3}{2} 9
26	" 7	29	Sunday 48
27	Sunday 37	30	No. 1 & 2 12
28	1 M. S. 2 7	Dec. 1	"
29			
	No. 1 8	2	***************************************
30	No. 1 & 2\frac{3}{4} 7	3	No.1 7
Oct. 1	No. 1 & 2 8	4	" 10
2	" 7	5	" 10
3	" 8	6	Sunday 59
4	Sunday 45	7	No. 1 8
5	No. 1 & 2 9	8	"
6			
	" 8	9	No. 1 M½ S 2 8
7	***************************************	10	No. 1 M S 2 9
8	***************************************	11	" $2\frac{1}{2}$ 9
. 9	" 7	12	No. 1 M S 11
10	" 7	13	Sunday 56
11	Sunday 46	14	No. 1 M S 10
12	No. 1 & 2 8	15	No. 1 M S 23 13
13	"	16	" 2½ 8
			42 **********
14	8	17	No. 1 M S 10
15	***************************************	18	No. 1 M S 2 12
16	" 9	19	" 15
17	" 8	20	Sunday 68
18	Sunday 49	21	No. 1 M S 2 9
19	No. 1 & 2 8	22	" 10
20	" 8	23	" 8
21			***************************************
	***************************************	24	*********** 12
22	***************************************	25	Christmas
23	No. 1 M. S. 2 7	26	No. 1 M S 2 13
24	" 9	27	Sunday 53
25	Sunday 49	28	No. 1 M S 23 9
26	No. 1 M. S. 2 9	29	No. 1 M S 7
27	" 8	30	" 9
28	" … 7	31	"
29	**********	31	14
29	No. 1 M. S. 2 9		

Engineer's Report of Number of Days in which Water Power was employed at Saxonville Mills for Consecutive Years.

					Days.
No. 1 Mill, from	June 17th.	1871,	to December	31st	 401
2	** **	66	44	66	 $78\frac{1}{2}$
Mills together "		66	44	66	 26
No. 1 Mill, from	January 1s	t, 1872,	to December	31st	 192
2	66 61	66	46	6.6	 $175\frac{1}{2}$
Mills together "	66 60	66	66	66	 125
No. 1 Mill, from					196
2	66 61	66	"	66	210
Mills together "	66 61	66	66	66	 164
No. 1 Mill, from				31st	 1593
" 2 " "	"	""	4.6	66	 184
Mills together "	66 6		66	66	 154
No. 1 Mill, from					132
2	"			66	 1523
Mills together "	"		66	"	 -89

Engineer's Report of Number of Days in which Steam Power was employed at Saxonville Mill for each month in Consecutive Years.

MILL No. 1.

	1871.	1872.	1873.	1874.	1875.
	Days.	Days.	Days.	Days.	Days.
January.		4		1 1	22
February		4 9½			201
March		8			81/2
April			-,		
May	0.1	102	5½		10
June	21/2		21	4	10
uly	• 23½	26	26	25	26
August	241	16¼ 7	$ \begin{array}{c c} 17\frac{1}{2} \\ 25 \end{array} $	17 24	26 26
September October	$\frac{24}{23\frac{1}{2}}$	'	12	27	11
Votober November			3	24	31
November December	$\frac{12\frac{1}{2}}{7\frac{1}{2}}$	3	13	26	4
Jecember	12	o	12	20	4
	1151	843	1113	1475	1575

	No.	

	1871.	1872.	1873.	1874.	1875.
	Days.	Days.	Days.	Days.	Days.
January		81	2	1	22
February		104	51	1 2 1	17
March	1	16	$\begin{array}{c} 2 \\ 5\frac{1}{4} \\ 1\frac{1}{2} \end{array}$	-	31
April		174			
May		81	33		3
June	$2\frac{1}{2}$	7 1/2	154	4	10
July	19	26	22	16½	18
August	22	20	15	15	17
September	27	63 25 3	16	211/2	13½
October	101	21/2	11	27	10
November	3	34	4	14	4
December	9½	14½	23	13½	17½
	91	1383	981	112½	1351

Josiah W. Blake, sworn.

Q. (By Mr. Hodges.) What is your residence?

A. I am taxed at Westboro. Q. What is your occupation?

A. I am treasurer of the Saxonville mills. Q. How long have you been treasurer?

A. Since 1859 or 1860.

Q. Do you know, and if you know please state, who makes the purchases of the coal for that establishment?

A. I make them.

Q. Where are the books, and what are the books in which those

purchases appear, as kept in your establishment?

A. Some of them were burned in the fire of 1872, and some are at the office,—those since, certainly. Since I knew that this was wanted, I have not had time to overhaul them. I may find them, possibly. Some of our old books were saved, and some lost.

Q. In what books would the coal purchases appear?

A. We have a book in which we enter, or intend to enter, all the bills and purchases for the mill.

Q. State what is done with those bills,—how they are dealt with?

A. We file them. We had not them in the safe. Some of the papers that were in the safe were very much charred and injured.

Q. Where was your office at that time?

A. 119 Milk street.

- Q. Would the purchases of coal appear in any other book than the book you have named? I suppose it would be called "Invoice Book."
 - A. The payment would be entered in the cash book.

Q. And as a payment for coal?

A. No, it does not always appear so. We receive from the man we purchase of one bill, trusting the files of bills for the purpose of going into particulars if they are wanted.

Q. Were any of those books or bills kept at Saxonville?

A. None that I have referred to.

Q. Now, have you caused to be made a statement of the coal, so far as you can — going back as far as you can?

A. We have drawn off this statement from 1870.

Mr. Butler [interrupting]. As you did not make up this statement, you cannot testify about it any more than I could. Did you make it?

The WITNESS. No, sir.

Q. (By Mr. Hodges.) I only ask you as to what you have done. You have found some means of going back to 1872?

A. This statement we have taken from the bills on file.

Mr. Butler. I object to his testifying about any statement which he has not himself made.

Mr. Hodges. He has been aiding in the preparation of it, since the time that you said you wanted it.

The Witness. Mr. William Butler [the clerk for the Saxon-

ville mills read off the bills, and I put them down.

Mr. Hodges. Some of the bills prior to the fire appear to have been found; or is that which I now indicate to you taken from the book?

Mr. WILLIAM BUTLER. That one month previous to the fire happened to be in the desk. I was paying the October bills, and that is the reason why they happened to be there.

Q. What is there there prior to November, 1872?

A. There is for the year 1870 and '71, and from January, 1872, up to November.

Q. From what are those taken?

A. Those are taken from the bills as far as we get them, and copies from the book.

Q. And if the bills were burned and were not in the safe, then

it was taken from the book?

A. At the time of the fire I went to the store. I found it was going to burn the store. I pulled the drawers out of the desk and left the desk, and sent the drawers with the papers off. That accounts for our saving some papers and not others; the others which had been put away in boxes I had not time to save.

Q. Now, what is the form of the books in which any have been saved — because we want the books here if they are capable of

being brought here?

A. The book at the store has all these items, but it is mixed

up with all the other purchases at the mills.

Mr. Hodges. Precisely. But let the gentlemen have the opportunity of seeing them. I will now turn the witness over to General Butler, and while he is cross-examining him I will send Mr. William Butler for the books.

Mr. Butler. I would not do that. Wait until I get through before you do it. I don't think it will then be necessary.

Cross-examination.

Q. (By Mr. Butler.) You, as treasurer, contracted for a quantity of coal to be delivered at Saxonville year by year?

A. Yes, sir.

Q. Making your purchases pretty much all at one time, or meaning to?

A. Not always, sir.

Q. Not all at one time, but to fill up your coal for the year.

A. No, sir.

Q. Very well then; you make them from time to time. Now what I want to know is this: Is there any check kept at Saxon-ville so that you may know whether you get the coal there which you buy?

A. We do not reweigh it, sir, at Saxonville. We occasionally

have a cargo weighed from the vessel into the cars.

Q. But don't you in some way contrive to get a check upon it

so as to see whether you get the right amount?

A. We send up a copy of the bill of the coal, and they mark it as received when it is all there, or supposed to be all there.

Q. They mark it as received?

A. Yes, sir, they mark it as received.

Q. Do they keep that copy?

A. They do not. They send that to us.

Q. Don't they make any entry of the coal received?

A. I don't think they do at Saxonville, sir. They may have a memorandum-book. I will not be sure of that. I am very sel-

dom at the mill. Mr. Simpson attends to that.

Q. Then, for aught you know (you causing no weighing to be made), somebody may make off with two or three cart-loads, without its being discovered, in the business of a great corporation? if there is no check kept upon it?

A. I cannot say that it is not done, sir. Q. Do you believe that there is no check? A. I have never believed that it was done.

Q. You never have believed that there was any check kept?

A. I never have supposed that any of the coal was lost.

Q. But do you believe that there has been any sort of caution taken by which loss could be detected, — by keeping the amount of the coal at Saxonville — every possible precaution?

A. Every possible precaution would be to weight every pound.

Q. I mean "any possible precaution?"A. Yes, sir. I think so.

Q. What is it?

A. In counting the cars.

Q. Do you keep an account of the number of cars at Saxonville?

A. I believe they do, but I cannot swear to it.

Q. But you assume that a car-load is about so many tons?

A. If they keep an account of the cars, it is merely to know that we get all the cars that are loaded from a cargo.

Q. Well, it is easy enough now to ascertain from the freight how many tons you have had carried — the freight on the road?

A. Yes, sir.

Mr. Hodges. If I had time I could go into that.

Q. I only wanted to see if it was possible of ascertainment. Now, is that coal used for other purposes besides the making of

steam or the heating of the mill?

A. I buy stove-coal, which we let the hands have at cost, which I have not taken out of this list. The broken coal we use for the steam. Of course we only use for steam and heating a certain white-ash coal. Of course the same steam-boilers heat the mill.

Q. But you buy considerable more coal for the hands, and Mr. Simpson, I suppose, uses it for his greenhouses and other pur-

poses? How is that checked?

A. That is arranged up there. I have no control of that. don't know for what it is used, or how much is used.

Q. How much did your new dam cost?

A. That was built before I was there, sir, and I have not the knowledge or the figures.

Q. Has that not been raised?

A. It was raised four feet — I think it was four feet. I cannot give you the year, but it was before 1859.

Q. Don't your books at Saxonville show that?

A. That was raised, I think, before the fire. I am not certain whether these books that were saved will show it or not.

Q. That expenditure was made at Saxonville?

A. Yes, sir; it was made at Saxonville.

- Q. Don't the Saxonville books show that?
- A. I cannot say, sir. Q. I wish you would.

A. I can ascertain.

Q. What did your Corliss engine cost?

A. That was put in before I was there, and I have no knowledge.

Q. Won't the books show?

A. I think they will, if we have them.

Q. I wish you would let us know what it cost — from the original data. What did your boilers cost?

A. There has been one put in while I was there, and the others

before.

Q. There has been, then, but one new boiler since 1860? A. I think not.

Q. That would be sixteen years. You would not want to put in very much for the depreciation of that. I would like, if you can, to have you give me the cost of that engine.

Mr. Hodges. You sent it to me once, Mr. Blake. [Hands wit-

ness a letter.

Mr. Butler. I would like to have the original data, unless Mr.

Blake can swear that he made this entry which I here find.

The Witness. When Mr. Hodges asked me for the cost I said I could only give a rough estimate of the cost of the machinery, "as below."

Mr. Butler. That was estimated; I don't want anybody's

estimate; I have asked for the bill.

- Q. (By Mr. Hodges.) From what did you take that amount which is given in the letter which you wrote to me, which you now have in your hand? Was it taken from the books or was it an estimate made?
- A. I think it was an estimate made by Mr. Hill, or the machinist who has the care of the engine, etc.

Mr. Butler. I thought every well-regulated manufactory in

the State knew what the cost of their steam engine was.

The WITNESS. I have given it here as "Engine and setting, \$14,000."

Mr. Butler. You need not state what is in the letter. me see it before you put it in in that way.

Mr. Hodges hands the letter to Gen. Butler, who reads it.

Mr. Butler. I object to it. It is an estimate not made from any books.

Mr. Hodges. I shall not press that it go in. I hand it to the witness as the best information he could give me at that time.

The WITNESS. Any original bills that we have are at your disposal.

Mr. Butler. I would be very glad to see Mr. Corliss's receipt,

or if you will write and get his bill.

Mr. Hodges. I tell you that cannot be. The engine was not bought of Mr. Corliss. Whom it was bought of I don't know; but it was bought here. I have no idea who it was. You can have it, and you shall have it, if it can be found.

The WITNESS. Such of our papers as were saved were in a good deal of confusion. Not supposing they would ever be

wanted, they have never been sorted out.

Mr. Butler. It is not for me to advise a gentleman of your experience, but Saxonville and Boston will not both burn down at the same time, and if you had two sets of books how convenient it would be!

Mr. Hodges. Will you have Mr. Blake go up and get the books?

Mr. Butler. I don't care for them.

Mr. Hodges. You asked us yesterday in respect to the product of the mill, and I told you I thought it was gone. But it seems that some special sheets were kept, and I-have had an abstract made of them, and there is the list, with Mr. Blake to speak about it, if you desire, - a list of the blankets, etc., that we have made at the mill — made in 1859.

[Mr. Butler takes the list and examines it.]

	SINGLE BLANKETS.	YARDS PIECE GOODS.		POUNDS SALE WORSTED.	POUNDS YARNS.	POUNDS BOX WORSTED.
1859	104,072	70,407	1 2	430,901	288,633	135,987
1860	112,237	71,285	1	396,372	405,986	184,161
1861	129,133	70,706	2	158,601	132,322	108,003
1862	92,685	358,212	1	201,942	96,247	175,318
1863	135,437	191,233	2	275,3212	75,911	206,337
1864	120,208	320,570		273,884	44,367	250,192
1865	213,526	197,138	1	245,3441	159,608	277,202
1866	182,072	41,110	2	348,002	145,346	314,515
1867	179,125	50,867	2	254,223	194,457	310,768
1868	93,411	44,619		172,664	293,601	363,672
1869	157,680	51,034	2	276,4693	247,515	407,242
1870	197,152	13,372	3	257,5842	218,183	444,788
1871	200,071	5,475	2	193,267	236,376	509,589
1872	216,710	2,985		127,131	185,163	671,177
1873	219,783	2,507	1	188,331	142,482	583,704
1874	217,787	1,500	2	150,667	204,570	650,273
1875	218,051	848	2	74,728	181,336	679,364

E. O. E.

Mr. Butler. I think we will have this in, sir. Q. (By Mr. Hodges.) That is taken from the abstracted sheets that you saved yourself, Mr. Blake, at the time of the fire?

A. Yes, sir.

Q. (By Mr. BUTLER.) Why did you begin at 1859? A. That is when the present corporation commenced.

Mr. Hodges. The other was another corporation, and its books have never been in the keeping of this corporation.

WILLIAM BUTLER, sworn.

Q. (By Mr. Hodges.) Where do you reside?

A. At Medfield, Mass.

- Q. What is your occupation?A. I am clerk for the Saxonville mills.
- Q. In reference to the coal as sent to the Saxonville mill, what is that which I now show you?

DATE.	Tons.	AMOUNT.		
	-			
1870.				
April 6	274	1,635 14		
March 6	241	1,626 00		
July 15	258	1,707 96		
16	250	1,670 00	1 000 77	*** • • • • • • • • • • • • • • • • • •
November 9	207	1,308 24	1,230 Tons.	\$7,947 34
1871.				
May	50	487 50		
	315	2,472 75		
June	379	2,558 25		
August	230	1,796 00	,	
September	431	3,331 63		
December	170	1,287 00	1,575 Tons.	11,933 13
1872.				
January	224	1,641 25		
April	40	360 00		
May	386	2,505 64		
September	484	2,786 86		
October	460	2,875 00		
November	10	76 15	1,604 Tons.	10,244 90
1070				
1873. June 9	407	0.040.00		
June 9	427 514	2,942 92		
July	848	$2,467 49 \\ 5,639 20$		
August	478	3,298 20		
	402	2,773 80	2,669 Tons.	17,121 61
		_,	2,000 10113.	17,121 01
1874.				
April	286	1,887 60		
Manak	452	3,051 00		
March April	580	3,799 00		
May	450 317	$2,947 50 \\ 2,092 22$		
September	431	2,884 70	2,516 Tons.	16,662 02
~ op tom ou	101	2,004 10	2,510 Tons.	10,002 02
1875.				
February	97	827 36		
March	168	1,391 73		
Mare	335	2,471 00		
May	138	1,012 19		
September	673	4,206 25		
October	82	519 23 579 8 6		
August	331	2,337 43		
October	505	2,398 75		
November	500	3,275 ₀ 0		
November	570	3,790 ŏ5	3,472 Tons.	22,809 30

A. That is an abstract from the bills — made up from the books and bills that I had in the office. To the best of my knowledge it is correct.

Cross-examination.

Q. (By Mr. Butler.) Do you know what kind of coalit was?

A. It was broken coal; it was steamer coal, - large coal, what they call broken coal; it was for steam purposes.

Mr. Hodges. This is the same paper that Mr. Blake had?

[Gen. Butler takes the paper and examines it.] Q. What have you paid for coal this year, sir?

- A. Mr. Hodges sent up to me for this memorandum, and I had it completed as far as that; I finished that one year.
 - Q. You have not got on the amounts since November, 1875? A. No, sir; I was at work on it when Mr. Hodges sent for me.

Q. What do you pay for coal this year?A. Well, Mr. Blake buys the coal; I think he could state better.

Mr. Hodges. He is here, sir.

Q. Are you sure that these, since 1872, are all the purchases that you made?

A. I say that is the best of my knowlege; I have not checked

it off, General.

Q. I wish you would go over it and check it off.

Commissioner Russell. Mr. Hodges put it in this form. Let him go over it and check it off, and if there is any correction he will report it, so that we may not be hindered by waiting for that.

Mr. Butler. You need not wait for that.

Josiah W. Blake, recalled.

Cross-examination resumed.

Q. (By Mr. Butler.) Have you bought your coal for the coming winter for your mill?

A. No, sir.

Q. What did you pay for the last?

A. I think it was \$5.25, delivered on the cars. Q. What is the freight to Saxonville?

A. They charge us, I think, \$1.20, and then return us 20 cents at the end of the season.

Q. So that it came to a dollar?

A. Yes, sir; we estimate it at a dollar.

Re-direct.

Q. (By Mr. Hodges.) Does that go to Saxonville or Boston?

A. To Saxonville.
Q. It makes \$6.25 to Saxonville?

A. Yes, sir.

Mr. Hodges. I think that constitutes my case, General Butler. Mr. Butler. Are you not going to prove about Farm pond?

Mr. Hodges. No, sir.

Mr. BUTLER. Do you claim any right to flow Farm pond?

Mr. Hodges. Yes, sir.

Mr. Butler. I think you had better prove it then.

Mr. Hodges. We claim the title only growing out of the ownership of that quarter of an acre. Now, instead of making a controversy here about the title to that, let us keep whatever damages are allowed for Farm pond separate, and then if you do not say that we have got a title to it I shall not press it. I believe we have a complete title to it.

Mr. BUTLER. All I can say is that I do not see as you have any title or any right to flow Farm pond for a minute. This is the point I wish to bring out: Assume, as you might well, that you own a dam down below Farm pond. That does not give you a right to flow Farm pond and use it as a reservoir at all. Now my

brothers claim that they have a right to flow Farm pond.

Mr. Hodges. I agree. That is exactly my position now. If by the laws of Massachusetts we, having the outlet of Farm pond, have not the right to flow it and accept the penalty for flowing it, and that right is not worth anything, then the property is good for nothing.

Mr. Butler. You paying the damages?

Mr. Hodges. Yes, sir.

Mr. Butler. That is: you think you can settle with them

cheaper than you want to settle with us.

Mr. Hodges. No, sir. I think the right to put a dam there and pay damages is something. The size of the pond is in evidence. It was put in in the Essex Company's case.

CLOSING ARGUMENT OF HON. B. F. BUTLER FOR THE RESPONDENT.

Although, as far as I am instructed, may it please your Honors, we see no occasion to put in any testimony, we by no means agree to some of the facts attempted to be set up here. I have no doubt that the taking of this water will be a substantial damage to the proprietor of Saxonville factory, at certain seasons of the year. The first question is, What are the petitioner's rights? When we get that, then we will come to the measure of his damages. And I claim that all the right that he has is to the natural run of the stream, uninflated by any artificial erections. And upon that I would like the opinion of the commissioners. If they differ with me upon that proposition, that proposition I desire to take to the courts. To explain precisely what I mean, gentlemen, I mean this: That if the amount of water running on the day we took the water was increased by any artificial means, not within the control and ownership of Mr. Simpson, that increase does not belong to him, and to that increase he has no right. For instance, looking on that map of the Concord river and its water-shed, you will see the reservoir built by the city in the town of Hopkinton. The dark blue was the original pond which was spoken about in the other case. The light blue was that given by the city as compensation for taking the Cochituate lake out. And so whenever the water is raised by an artificial dam, so that its flow is the greater in a dry time (when, alone, as I claim, will the Saxonville dam be injured), then and in that case, Mr. Simpson has no right to it, because he has no claims upon the persons owning it to keep up the dam for an hour. They have a right to let it go at any time. They have a right to use it as they please, provided they do not use it to his detriment in this way; they have no right to store up the water in great quantity, and let it down to flood him; they have no right, undoubtedly, to keep it back to such an extent that he would not get any of it. But within those rights, he has no control over them. have no right to keep it back to his injury; they have no right to let it down to his injury; and he has no right to claim from them that they shall regulate it for his benefit. Therefore, he cannot claim from the city any pay for that. That is what I mean by the right to the natural run of the stream. A stream in a state of nature coming to him, they

have taken, — because that stream is Sudbury river. We, I agree, are to make him whole (under the limitations to which I will call your Honors' attention), so far as we can make him whole, for that which he stores himself, and for that which he has the capacity for storing himself, without injury to anybody else. I deny, utterly, that there is any claim of damages against us for what he might do hereafter by damaging somebody else, which is the claim set up here. I deny that there is any tangible money value that can be put in the claim of damages, for a right to damage somebody else, and pay those damages, and then be paid for what he would have left over after he has done that. I

think that is a little too shadowy.

What he has done and paid for I agree that he has a right That is his own. But I ask you especially to rule upon this question, and that disposes of Farm pond. Because he owns the dam at the outlet of the pond (which dam does not flow it now and never has flowed it), I utterly deny that any right which he would thereby have to flow Farm pond (by paying the damages) is a valuable right, for which he should be paid. And you see where you would be if you undertook to give damages. How do you know what the damages of flowing Farm pond would be? For illustration simply — I understand that if you flow Farm pond two feet, you would flow all South Framingham. From the way that the land lies, I have no doubt that you would flow the suburbs of South Framingham. It is of no consequence whether that is so or not, — it is an illustration merely; and the fact that this mill has been running now for forty years, and that there has been great want of water, and that they put in three steam engines rather than flow Farm pond, is a pretty strong circumstance to show that, in the judgment of the owners simply, it was much more economical to put in engines than to flow Farm pond, and that that right is a valueless one. Therefore I am not troubled on that score at

First, I deny that there is any evidence of any right at all to flow Farm pond; second, I deny that if there were that right it would be a valuable right; and thirdly, I deny that, however valuable, it is a kind of right which should be put here in damages.

Upon this question, gentlemen, of the right in other people to the storage of water, I have a case from the Law Times Reports, Vol. XIII, new series, page 74,—

"Gaved vs. Martyn, — from which I will read: —

"The plaintiff, being desirous of increasing the supply of water to the leat mentioned in the preceding paragraph,

continued the leat to a point in the course of a natural stream or brook, opposite to where refuse water was discharged by tinners, from their mine, by a drain made from the mine to the brook. He placed a launder or trough across the brook and intercepted the water from the mine, carrying it across the brook without allowing it to mix with the water of the brook, and thence conducting it by the leat to his works. He used the water in this manner for more

than twenty years."

That is to say, that the supply was entirely at the will of the parties who owned the mine and who were pumping it, and they might or might not continue; that he could not prescribe rightly by having simply used it at a place where it flowed into the brook, and put a trough to flow it across to his brook; that it was not a thing that he could prescribe. He did not undertake to prescribe against the tinners, but did undertake to prescribe against the man who owned the brook which he had used for twenty years, and also against the man through whose property it ran, — which made it

still stronger.

There is another case which I will take this opportunity to cite, from the Law Times Reports, Vol. IV., new series, page 87,—the case of the Medway Navigation Company against the Earl of Romney. I ventured to say to you the other day that a superior right to use of mills was the right of navigation. (I have insisted, and shall insist by and by still more strongly, that the first right is that of the public to use the water for drinking purposes,—I don't care where they live, it they can get at the water.) Now, this case was right to other way. The Act of Geo. II. had given a right to the river for public navigation, and the question was whether anybody had any right to take any water

out of that river for mills. The report says: -

"It was held that upon the true construction of the 13 Geo. II. c. 26, s. 2, the plaintiffs had not such a limited right in the river as a private grant of the river might have conveyed; but that it created such a property and interest in the water which was interfered with by the obstruction of it for the purposes to which it was applied by the defendants, which purposes were more extensive than those for which a riparian proprietor could insist upon appropriating a stream, as it passed his land, and that it was not necessary that it should be an actual damage to the navigation, because the Legislature intended to give the company such an interest in all the water of the river, for the purposes of navigation, as was interfered with by the obstruction of any part thereof."

And the effect was, that "Since the passing of the said acts, persons desirous of erecting mills along that part of the Medway to which these acts relate, have always previously applied to the plaintiffs for permission to use the water of the river for the purposes of their mills. Such permission has sometimes been granted, and sometimes refused, by the plaintiffs; but it does not appear that the water has been used without the permission of the plaintiffs for any mill erected since the passing of the said acts."

And a similar question was argued on the demurrer—whether, without showing some appreciable damage, that action could be maintained; and they held that for the purposes of navigation they must not interfere with it at all,—that it was not a question which could be in that way dis-

cussed.

Now, then, Mr. Simpson, or the Saxonville Company, the plaintiffs here, having a right to the natural stream of Sudbury river, the question is "How do we injure them?" It is said that we take all the water of Sudbury river, and therefore we must pay for it all. There are two exceptions, however, showing that the Legislature did not intend that we should pay for it all. The first is, that we are to let a million and a half of gallons run every day, wet or dry. In the second place, we are not to stop the water of the Sudbury river at any time when the water is flowing over the dam of Lake Cochituate. When Lake Cochituate is full, Sudbury river must be allowed to flow in its natural channel.

I will read from the act, so that I may state it with perfect

accuracy. Section four is as follows: -

"Nothing contained in this act shall be so construed as to authorize the City of Boston to reduce the water in Sudbury river below a sufficient height to maintain at all times a running stream therein which shall flow at least one and a half million gallons a day for each and every day in the year, or to draw from Farm pond or Sudbury river into Lake Cochituate when the water runs over the dam at Lake Cochituate. or to prevent the inhabitants of the towns of Framingham, Ashland, Southboro', Hudson and Westboro', from taking from the Sudbury or Assabet rivers, or Farm pond, so much of the waters hereby granted, as shall be necessary for extinguishing fires and for all ordinary domestic and household purposes, and for the generation of steam, or for cutting and carrying away ice from said pond; or as to prevent the Boston and Albany R. R. Company, or the Mansfield and Framingham Co., or the Boston, Clinton and Fitchburg Co., from taking water from Farm pond for use in locomotive and railroad engines, or for other railroad purposes, under such

regulations from the Council of the City of Boston as may be essential for the preservation of the purity of the same."

So that practically we are to let it run, — for we cannot draw it into Lake Cochituate except when the water is below the top of the dam. That was evidently got as a concession by the mill-owners, - by the Saxonville people especially; and the provision about the million and a half gallons was another concession. And my principal use of those two is to show that the Legislature meant that we should not pay any damages beyond what was the actual damage; in other words, that we should not pay for any water taken from Sudbury river when everybody had enough for all that they would use, or were accustomed to use, or could use.

Leaving out, for the moment, the consideration of the question of using it night and day, suppose, for illustration, that six months in the year Saxonville has all that it can use without flowing upon other people, and that the other six months it had not any whatever; why, then, I should think the measure of damages should be that only that was to be considered which was taken during the six months that they had not any. Inother words, it must be a perceptible damage to them; and it is not perceptible when the water is running to waste over their dam, without the capacity of storage. The Legislature meant this to be a practical and not a speculative question. The courts deal with it as a practical and not a speculative question. All water rights are practical and not speculative questions. Our court has so decided; the English courts have so decided.

Now, in the sixth of Barnwall and Cresswell, it came up in another view, — in the case of "The King vs. Russell," which was a case very much considered. It was where Mr. Russell, the defendant, had set up certain "coal stakes" (coal piers, as we should say, I suppose) in the river. Of course, they interfered in some degree, or in a very small degree, with the navigation. There was an indictment brought against Mr. Russell for a nuisance, because they said that any interference with navigable water without the right of the king was not to be tolerated, and was a crime; and that question was in discussion before the court. There were two things then taken into consideration, the first of which will

appear as I read from page 590:—

"Where there is a space of water of very considerable extent, some part may be most usefully applied for purposes of commerce, and that which is so applied may be over and above that which is sufficient for navigation; and where a great public benefit results from the abridgment of the exercise of the rights of passage, the great public benefit makes that

abridgment no nuisance, but a useful, beneficial and proper

purpose."

The only other point in the case is, that they held that that public benefit would be the reduction of the price of coal (which was at Newcastle) in London; that it need not be a benefit to the people of Newcastle immediately, but that the benefit might result elsewhere, — as the public benefit results here, — a benefit to the people of Boston, and a det-

riment to the people of Saxonville, more or less.

But my proposition is now simply, that where the taking of the water for a public purpose does no appreciable damage, nothing is to be paid. True, Mr. Simpson has the right, in one view, to all the water of Sudbury river, — that which runs when there is a thousand million of gallons running over in a second, as in a freshet, and, as at some times, when there is not enough water there to water his horse, but would be if the river was in its natural condition. But that is not to be paid for, — that which is not appreciable as damages is not to be paid for.

Now, that was held in our own courts, in the tenth of Cushing, — "Elliot vs. Fitchburg R. R.," p. 191. The

court says: -

"The instruction requested by the plaintiff is, we think, founded on a misconception of the rights of riparian proprietors in water-courses passing by or through their lands. It presupposes that the diversion of any portion of the water of a running stream, without regard to the fitness of the purpose, is a violation of the right of every proprietor of land lying below on the same stream, so that, without suffering any actual or perceptible damage, he may have an action

for the sole purpose of vindicating his legal rights.

"The right to flow water is now well settled to be a right incident to property in the land; it is a right publici finis, of such character that, whilst it is common and equal to all through whose land it runs, and no one can obstruct or divert it, yet, as one of the beneficial gifts of providence, each proprietor has a right to a just and reasonable use of it as it passes through his land; and so long as it is not wholly obstructed or diverted, or no larger appropriation of the water running through it is made than a just and reasonable use, it cannot be said to be wrongful or injurious to a proprietor lower down. What is such a just and reasonable use may often be a difficult question, depending on various circumstances. To take a quantity of water from a large running stream for agricultural or manufacturing purposes would cause no sensible or practical diminution of the benefit, to the prejudice of a lower proprietor; whereas taking the

same quantity from a small running brook, passing through many farms, would be of great and manifest injury to those below who need it for domestic supply or watering cattle; and therefore it would be an unreasonable use of the water, and an action would lie in the latter case, and not in the former. It is therefore to a considerable extent a question of degree."

The opinion was a very elaborate one, and it turned upon the exact question whether a man has any right to that which does not perceptibly damage him, in the case of run-

ning water; and the court says, No.

Well, now I desire, in this connection, to read to you from the fourth of Cushing, page 60, "Lombard vs. Stearns,"—the opinion of a gentleman whose opinions were mostly held to be law in this Commonwealth a short time ago, upon a case where a mill-owner undertook to say that his stream could not be diverted at all without paying him damages; that he owned the river as against the public who wanted to

drink it. Chief Justice Shaw says:—

"It is contended that this act is unconstitutional and void, because it in effect authorizes the corporation to take private rights of property for a use which is not a public one, and therefore not within the authority of the Legislature, even though provision is therein made for compensation for any such damage. It may be very questionable whether the plaintiff, taking the use of the brook for a mill-power, does not take it subject to the reasonable use of all proprietors above, in or near whose premises it passes, for domestic purposes, for such ordinary trades as require the use of water, such as tanning, bleaching, dyeing, and the like, and also for the extinguishment of fires."

It is not required to be riparian proprietors.

"If such be the right of the inhabitants to the use of the water, it may be a question whether it is a greater encroachment on the plaintiff's rights, to take water by conduit and hydrants than by buckets and engines. But as this right may involve a question of fact which this case has not reached in its present stage, we lay no stress on this, but merely suggest it in passing.

"But we can present no ground on which to sustain the

argument that this act does not declare a public use."

That is, the private corporation of the Springfield Aqueduct Company, incorporated for the laying of an aqueduct for the purpose of supplying the village of Springfield with pure water.

Therefore, we have a case before us where for a proper public use no appreciable damage is done in a portion of the year; and during that time you are not, I submit, to pay for the water.

Now, one other consideration, as bearing upon that, and that is, this attempt to have damages for supposed work at night. You will rule that upon the proposition of showing whether this is a more constant stream, by showing that it is used by night and therefore more valuable, — if that is proper. But my proposition is this: That upon this question of damages, it is only for the use by the day, — the ordinary use such as men have ordinarily made of it in a long series of years, — the ordinary action of mankind in using water; that it is no fanciful use that might be made at night. I could have suggested to my brother a better use that he might have made of his water by night than throwing it away, or than to keep the hands at work night and day. He has to use a steam engine. Now, suppose he had, all night, while it was running away, compressed air for the purpose of using it to run his mill during the day.

Mr. Hodges. We were just going to do that when you

took the water.

Mr. Butler. The Legislature has put its ban upon that,—that it is not best for men to be worked more than so many hours a day—men and women,—and experience has shown that. Now, I say that you must deal with the ordinary common daily habits of mankind, in using power, whether steam or water.

I do not mean to say that if a man had a paper-mill on that stream, which he was accustomed to run a portion of the night, that taking away from him at night enough to run that portion of the mill would not do him harm, if the mill was fitted up for that, and your Honors saw that was the use to be made of it. But where it is fitted so completely and wholly and thoroughly for another and different use, and would be only valuable for that use, and where (as two of your Honors know, if all three do not), the whole plan is useless and valueless if it should be changed, I cannot conceive how this question of damages for the night comes in at all. I wish you would say in your report whether you find damages for the use by night. You are to find what? The value of the water that we take, to Mr. Simpson, and that is for the ordinary use of it. You are to get out of the region of fanciful valuations. If there had not been some extraordinary awards made in this Commonwealth by referees, the idea of fanciful valuations would have been abandoned, and these matters, largely, would have been adjusted. But you can see how men's imaginations are excited whenever the city takes any water. For instance, our very

good friend here, who I have no doubt is as honest a man as lives, undertook to tell you how, in the winters of 1872, '73 and '74, he perceived that the city had injured this privilege. I have no doubt he believed it with all his soul; — and so if a quack doctor had given him a bread pill, when he had the stomach-ache, his stomach-ache would have stopped in virtue of the exercise of the same force of imagination. So I am trying to get rid of any inflated value; and on the other hand, I want to say for the city, that I am not instructed to say that the city do not want to pay every fair dollar to make these corporations good. It has got to come out of the taxation of the city. The city officers are no more interested in it than every other citizen; and therefore I want to get at that. Now, what is that? Why, I say a very small amount, - because I say to you, that upon this evidence, applying your judgment and skill as skilled men, there is not more than fifty horse-power in that stream during the dry months of the year. I want you to hold me to that statement, for I propose to make it good when the session is resumed this afternoon.

[Recess till $1\frac{1}{2}$ o'clock, P. M.]

AFTERNOON SESSION.

CONTINUATION OF MR. BUTLER'S ARGUMENT.

I said to the commissioners when we took the recess, that I did not believe they ever had more than 50 horse-power there in the summer, and with all improvements of the river, and with the natural run, much less. Now, I will tell you the grounds upon which I have come to that conclusion. In the first place, I lay out of sight largely all estimates of remembrance and all estimates of power by mere estimate, for your experience will tell you that everybody estimates a great deal more than they get. If it does not, your experience will be very different from mine. A man on a little stream thinks he has a great deal more power, to use a California phrase, than it "pans out"; and to show you how unreliable these estimates are, I knew a source which would settle the question largely, and I got it from my brother, and I am very glad to have it in. They all agree that the blanket machinery is by far the heaviest portion of their power, and the mill in which the blankets are made, which is No. 1, you have already heard, takes 190 horse-power, to 80-horse power for the rest, or something like that.

Mr. Hopges. The increase makes it 240.

Mr. Butler. Now their estimates of power have been,

that there is very little more machinery now in the mill to be carried than there was in 1860. One witness testifies there was only 25 per cent. more than there was in 1840, when they had the New England Worsted Company there, and only made flannels. Another testified that possibly there was 125 more there in 1864 than there was in 1844, and there was 20 or 25 per cent. more now than then. It takes power to make blankets. Now, let us see. In 1859, their product was 104,000 blankets; in 1860, 112,000; in 1861, 129,000; in 1862, 926,000; in 1865, when they ran day and night, 213,-000; in 1866, 182,000; in 1867, 179,000; it fell down again in 1868 to 93,000; in 1869 to 157,000; in 1870 to 197,000; in 1871, 200,071; in 1872, 216,000; in 1873, 219,000; in 1874, 217,000; and in 1875 it was 218,000. Well, now, with only 50 per cent. more machinery they more than double the production of blankets! Very well. The piece goods were 70,000 in 1859; 71,000 in 1860; 70,706 in 1861; 358,000 in 1862 (there must have been a large increase of piece-goods machinery, or else they did not run much of their machinery in 1860 or 1861); 320,000 in 1864; 197,000 in 1865; it fell to 41,000 in 1866, showing the war; 50,000 in 1867; 44,000 in 1868; 51,000 in 1869; 13,000 in 1870; 5,000 in 1871; 2,985 in 1872; 2,507 in 1873; 1,500 in 1874; and 848 in 1875. Again, in worsted they had 430,000 pounds of worsted varn for sale in 1859; 396,000 in 1860; 158,000 in 1861; a large amount of increase, 201,000, in 1862; 275,000 in 1863; 273,000 in 1864; 245,000 in 1865; 348,000 in 1866; 254,000 in 1867; 162,000 in 1868; 276,000 in 1869; 257,000 in 1870; 193,000 in 1871; 127,000 in 1872; 188,000 in 1873; 150,000 in 1874; and 74,000 in 1875. Then, all other yarns, 288,000 in 1859; 405,000 in 1860; 132,000 in 1861; 96,000 in 1862; 75,000 in 1863; 44,367 in 1864; 159,-608 in 1865; 145,346 in 1866; 194,457 in 1867; 293,601 in 1868; 247,515 in 1869; 218,183 in 1870; 236,000 in 1871; 185,000 in 1872; 143,000 in 1873; 204,000 in 1874; and 181,000 in 1875. These are yards and pounds. worsted yarns, again in piece: worsted, 135,000 in 1859; 184,000 in 1860; 108,000 in 1861; 175,000 in 1862; 206,000 in 1863; 250,000 in 1864; 277,000 in 1865; 314,000 in 1866; 310,000 in 1867; 363,000 in 1868; 407,000 in 1869; 444,-000 in 1870; 509,000 in 1871; 671,000 in 1872; 583,000 in 1873; 650,000 in 1874; and 679,000 in 1875.

Well, now there is a treble production. There must have been three times the amount of machinery to have made that production right through, and of course taking three times as much power, and you will observe they have put in the capacity of a steam engine. First, they had an old one of very little power, then the English, which is now extant.

Mr. Hodges. The English engine was the first.
Mr. Butler. Yes, that was the first, and then the other one, which is now extant, and then this present one, which runs up to about 320 horse-power. Very well. Now, I take it again as axiomatic, that if you have but 50 horse-power of water out of 320, it is a great deal better not to connect the shafting, and that is the reason why No. 3 mill was never rebuilt; and you will find in looking at that little book which we had here, and which I ran through in my examination, that when they began to run any considerable amount in steam they stopped the whole, and for the last six years that that book covers, when they began to run in steam they kept running in steam; they did not put it off and on but very little.

Mr. Hodges. I presume you want to speak exactly the facts. It is here in proof that neither of these mills can at

the same time employ steam and water.

Mr. Butler. I understand it perfectly. You misapprehend my argument. My argument is, that when you get out of 320 only about 50 horse-power of water, and the only cost of making the steam-power is coal, that, undertaking to run the two together, it is in practice quite as cheap to let your water-power go, as it is to put it on; and I appeal to gentlemen of experience upon that subject. I am not speaking about it before men whose good opinion I don't care to retain, as a man of some practical sense about manufacturing. I have lived in a manufacturing town all my life, and been conversant with these matters, and I ought to know something about it; and I have had occasion for the last nine years to examine it pretty carefully, and, as you saw when you were there, we have got a 600 horse-power engine—it can run up to that—at the Wamesit dam, so that you will find that the very idea which I put before you is taken at Saxonville; that in the summer they substantially quit using water, when it begins to run down very considerably, when it runs down quite low. They can use steam and water power. When the water-power is largely in excess of the steam-power, so that that can be the governor, then put on your steam; when the steam-power is largely in excess, then put on your water; when your water-power is largely in excess of the steam then put on your steam, because, don't you perceive, gentlemen, that a much larger per cent. than 10 per cent.,—I insist 20 per cent.,— is lost between the wheel and the machine on any extended matter of shafting, especially if that shafting is carried through large distances in half-a-dozen old mills? I have had some

experience, as you might have guessed, upon that. Every time your shaft sags like that, it is like turning over an elephant, and the friction is very large, and your different foundations of the mill and different foundations to the beams, from which the hangers come of your shafting, change, making very great friction, and a man loses more by undertaking to run his water-shafting in connection with his steam than to run without it, because there must always be shafting to connect the two, so that he will find that his engine is dragging his shafting, when he thinks he is

aided by the water, if he has but little water.

Now, the supply in the summer is a bagatelle, and the water used in the city is a bagatelle, in comparison with the amount used by machinery. Why, a million gallons of water over a foot-fall will give you only about one-third of a horse-power, .3281, or something like that, — some make it a little more and some a little less. A million of gallons is how fast a second? How much does the City of Boston use? They use 16 or 17 million gallons a day — that is all. Why, we have learned, and it is an admitted fact here, that from the 17th of June, 1872, if I remember the date right, to the 16th of September, 1872, they took two billions six hundred millions of gallons, all told. Well, let us see how that affected the coal. We have seen that this is a continually increasing quantity, from 1871 and '72. They were manufacturing 200,000 blankets in 1871, 216,000 in 1872, 219,000 in 1873; they dropped down some on their piece goods, that is true, but they went up from 127,000 to 128,000 on their worsted yarns, and went up some on the others. (I am only showing you what a bagatelle the city used in comparison with what it takes to run machinery.) Now, let us see how coal was affected. We did not take any in 1871, and they return us that they bought, in 1871, \$11,933 worth of coal; in 1872 we did not take water, and they return us that they bought \$10,000 worth of coal. We took a million six hundred gallons in dry time, which illustrates what I have been telling you, and what, if you examine that book, you will find to be true. And in 1873, when we didn't take any, they bought \$17,000 worth. see the city shut off in September, 1872, and did not take any till 1875. They got frightened by my law suit, and in 1874, when we did not take any, they had \$16,000 worth. And I have only taken these times because they say by illluck their books got burned up before that time. So you will see, gentlemen, that this is not any more than the amount of water which runs there in the summer, leaving them one and a half million pounds to wash their wool; and it is inappreciable by any measure known to mercantile dealing, as is the amount taken in the summer from the Lawrence

dam, and I can make no stronger comparison.

But that it is of some damage I agree, substantial damage; but that is all. These inflated ideas that are brought here of the injury done to them are all illusory and vain. The idea that we are to pay, first, for what? First, for all the water taken, on the ground that they might use it all when pressed by contracts so as to have to run nights, with a consequent loss of oil and waste, and all that matter which is done by running nights. Why, then, they didn't do any more. It don't make any change. Now, while they are making a third more goods than when they did run nights of all sorts, they don't make any change, and therefore they come in here and say, "Can't we cut out the channel and get a little more water-power down to where the river flows back?" I asked if it was ledge. They say "No, it is sand." Why, to get more water-power in a dry time, they will have to dig the gravel and sand out of their raceway, because they understand it exactly. Whenever they have enough water it is inappreciable; when they have too much water, it is equally inappreciable; and then they come in and say, "the possible right of flowing," and they have been there from time immemorial, and have never flowed Farm pond at all. They did raise their dam four feet, down below, and then they didn't flow out up to the grist-mill, and yet they claim that the City of Boston is to pay large damages for the right they have to damage somebody, and pay the damage, and the jury then stop them and say, "On the whole we don't think, under the Mill Act,"—as the jury have the right to,— "we don't think you had better raise your dam any more;" and if I were in the employ of the farmers before the jury I should put it to them, whether, upon the whole, if they could get along and supply the army with blankets without injuring the farmer, they had better not injure him any.

There, gentlemen, is the case before you. It is a question addressed to good common-sense and business capacity, and I cannot aid you any more on that. The law, as I insist, is that it is only an actual, perceptible, appreciable damage that we are to pay for, and that that is not shown whenever there is any considerable quantity of water, and that what we take out is inappreciable; and then the fact that it is still more inappreciable in a dry time from the very fact that they have worked so largely in excess of their water-power in a dry time; just as inappreciable as when the water-power is so largely in excess of the work. I tell you, gentlemen, the man is damaged by taking the water, when you take so much

that he cannot use the one nor use the other alone; but where there is an excess in every way, he is but little

damaged.

Now, what is the city going to do? How are they going to get their water? Why, ten million of gallons a day will last them for twenty years, forty years, fifty years; but they are going to make works, I agree, for all time. How are they going to get it? They are going to store it up in reservoirs; they are going to take it down in a conduit. Lake Cochituate cannot supply the present conduit. They are going to make a new one so that it would do no good to turn it into Lake Cochituate, for they could not get it through the conduit. It is only twenty millions of gallons a day, therefore they are going to make a new conduit and take this water down. Of course, they are not going to take it down and let it run to waste in Lake Cochituate, for they are storing water. They are going to make these large reservoirs and store it, depending upon the summer rains to take care of the evaporation and hold it there in store, and they are not going to want more than ten millions of gallons for the next twenty years, in all human earthly probability, and they are not going to want the capacity of storage for a good time, as they believe, for they think they are making it for all time. But that water don't belong to Mr. Simpson. He has got no place to keep it; he cannot store it; he cannot lay his hand upon it when it is rushing by in the spring at the rate of thousands of millions of gallons an hour. He has got no storage capacity; he cannot afford to store it up for that purpose. The little he would store, although it would be a great quantity for the city, if he could have all the storage of the city, would run his mills for only a short time upon storage alone, and that is the way the city is going to get this small amount of water which it wants for itself. Now, then, take this damage, whatever it may be, and pay for it. Now let us see how you are going to pay for it. All beyond what we store runs forever, as it did run, and goes down to Mr. Simpson's or Saxonville mills. Now, I am speaking to gentlemen who understand hydraulics. Is it not the fact, that, where you store, you increase the run during the whole year by the very act of storing, letting it down more slowly? Take, for instance, Lake Winnipiseogee, which you store up when it is full. By draining slowly over that immense surface, don't the water run longer in fact over the dam at Lake Winnpiseogee than it would run in the stream if there was no dam there, running clear and free? In other words, would not the freshet in the spring carry it off faster? Now, so with the storage by the city; it is really going to be an improvement all through the spring and summer months; it is going to be an improvement to the Saxonville property, and everybody else's property on the river below, during the spring and summer months. Now, you are to find some sum.

There are two or three considerations I want to bring to your attention upon that, and I want them judged by their

good sense, if they have good sense.

The Saxonville people are not to be injured for ten years at all, in my judgment. They come here and ask you for a sum, apparently through the testimony of Mr. Bacon, that \$24,000 a year would be the interest of. I cannot see what that is put in for otherwise.

Mr. Hodges. We expect a great deal more than that,

sir.

Mr. Butler. Do you?

Mr. Hodges. Yes, a great deal more. I don't want any

misunderstanding about it.

Mr. Butler. I am very glad to hear it. I had misunderstood. All right, gentlemen. When you get more than that, let us know. Probably they will not be substantially injured for sixty years. Now, if you will turn to the books of the English engineers, you will always find in their estimates, what they call the "capitalization of damages;" and whatever the injury is, let us see how it would be. \$24,000 would be six per cent on \$400,000. Very well. What would be the advantage to any mill of a capital of \$250,000, if they could suddenly have poured into their hands a quick capital of \$400,000, put in the bank, giving them unlimited credit to begin with, taking them out of the market; and that is no small consideration? They have the money in hand, they are only to pay out simply the interest of it. Upon the theory of my friend, they would have a sum of which that was the interest. They are to pay out the interest and forever keep their capital of \$400,000. Suppose they don't, and come to the conclusion to do exactly as they have done, buy no more coal, and go on for a series of years? It doubles in ten years, \$800,000; in twenty years, \$1,600,000; in thirty years, \$3,200,000; and in my judgment, for thirty years, they will not be damaged at all. And I acted upon that judgment when I sold out all my rights in that river at a very cheap sum. Mr. Simpson has got it, in my judgment, forty-four times as much.

Now, what sum will make them whole as capital? Put you there, sir, as an owner of that stock, in the light of the evidence you have got, which should you rather have, so much money or so much water? I tell you that you could not get them to agree to take the amount of water,

not one of them, which we took from them, if we had agreed to furnish it to them from our reservoirs for one quarter, if you could for one-eighth of the sum. Look at it, therefore, in a business point of view in that regard, and see what sum you will pay; and looking at it in its effect as capitalization, there is hardly an amount small enough,—if they are not to be injured for a long series of years, as they have not shown themselves to be, or likely to be,—which, with its increase, would not more than make them

good.

There is the other point that I must raise again. I insist that the meaning of the act is, that there should be some demand made upon the city, some information given to the city, that damages were claimed, so that the city should have the power to endeavor to agree upon the damages, and answer the claim before it is brought into court. This is a great public work. The city is called upon, before it can shelter itself under the act, to state what it is going to do, put on file its taking, with a positive description and when taken; then every party has the right to come and see about damages. They cannot know beforehand, they cannot search the titles of everybody. It is not like a case where there shall be a payment between man and man.

Mr. Hodges. If you rely upon that, perhaps it is only fair to me to say to you, and I think you will see it, that in June or July, a year ago, at my request, the city Water Board went to make an examination of our works, with the view of seeing if we could not make a compromise and settle this matter. I made no proof of it, because I in some way got the impression that you were not to press that point in this case. If you do press it, it really ought to have been proved so far as that statement will go to qualify the position you are

taking.

Mr. Butler. To that I have to say, that I argued this very point in another case before your Honors.

Mr. Hodges. Certainly you did, and in that case the city

board had not been there.

Mr. Butler. How do you know that? I don't.

Mr. Hodges. I do.

Mr. Butler. You and I are pretty well advanced, — too old, I am sorry to say, — at the bar not to know we try our cases upon the evidence produced before the Court. With your leave, brother Hodges, I will argue it upon the evidence, for I have a little word to say about this matter. I listened to my brother Merwin's argument, and it occurred to me possibly I should have to close upon that before I got through. The proposition is, they say you show a demand

and agreement, presuming the statute says "a demand;" no, "in case they cannot agree" it says. What is the use of those words? You must give some effect to the words of the statute, and I was trying to bring to your Honors' minds the fact that, with a great public work taking land over a large extent of country, they could not know whom they had damaged, and they at least ought to have an opportunity to examine it; and if my brother Hodges has done what he says he has done, and I should not feel myself authorized to doubt it anywhere else but in the present position of this case upon the evidence, then I have his opinion that it ought to be done as a condition precedent. I cite him as an authority, 1st, Hodges, passim. And it clearly ought to be done. The City of Boston, for a public use, executing a great public work, ought to be at least called upon, somehow and somewhere notified, that somebody claimed damages of them, before they are brought into court and put to expense. But I don't put it upon the eternal fitness of things, which it would seem to stand upon, but upon the exact words of the statute; but "in case they cannot agree," then you are to be called out, and not till then. How can a man agree about a thing that he has never heard of? He must have a chance to agree, if something is to fall upon him if he don't agree. Why, the very modest demand of my brother Hodges for damages, we should have agreed to at once, instantly, and have paid it up by drawing a check the next hour, if he had come with that demand to us, undoubtedly; but whether we would or not, we ought to have that option. At least, gentlemen, we ought to have had some limit; they should have said, "Why, we will take so much"—if it is millions, be it so— "for damages."

I don't think I can aid you any farther upon that point, but I entirely dissent from my brother Merwin's view of this matter. What do you do with these words of the statute, if I am not right? The matter is for your own good

judgment.

I wish that you would report the views of the law upon which you assess damages upon the several points I have taken, because here you see there is a class of cases: there is the Lawrence case, which settles one class of cases; this case, which settles another class of cases; the Talbot case will settle the third and only class which I know of, except the damages for flowing lands, and I don't think you will have any of those before you, because my brother Abbott thinks he will suspend Mr. Cutler's case. Now, it is of the last importance that we should get up to the Supreme Court, and we get up with your report without injury to anybody,

that I can see. That is, we move to set aside your report, because you have ruled wrong on some of these propositions I have made to you, and the court refuses, and we except to that refusal, and then we can get up to a jury; and that is why I raise these questions, thinking that you ought never to have been troubled with them.

CLOSING ARGUMENT OF E. F. HODGES, ESQ.

I think there was a case in the annals of the criminal law where a man had taken the watch of another, a very good one, and being indicted for it asserts his defence something in this way: "Why, he has never made a demand on me for the watch. I don't know that I shall ever want to use it, and I don't think I ought to be found guilty, because we talked it up in my family last evening, and agreed when I could get a better watch away from somebody else, I would return this if I thought best;" and I do not see but that, in many respects, the City of Boston stands rather in the position of that criminal, as represented here to-day. They have taken the water, and their sole defence is that they don't know as they need it; they may get some water somewhere else that is better; and if they do there is a talk among themselves that they will not use it, and in addition to that we have never

demanded it. We here demand it, gentlemen.

And here, and firstly, in response to much of the argument of the counsel, I propose to present whatever I have to say concerning his argument, before urging the views we entertain concerning our rights in this matter and our damages. The counsel asserts that the city are not now taking, and will not for years take, the water, and that you are to judge our damages by what the city are taking to-day, and what, in your judgment, they will take by and by, and when? Now, to treat that with entire respect, I submit, is not that a mistaken view of the question that is before us? Does it not involve an absurd proceeding in law? I believe the question before us is not what amount of water the city have taken on the 21st of January, but the right they have taken from us to hold any water. Is not that the question you are to judge, and is not that the only one? The amount they have taken, and all these questions concerning the value of the water, all of them are simply guides by which you are to estimate the value of the thing they have taken from What that thing is, I think, has been entirely misrepresented to you. As I have said before, the thing the city have taken, by that paper which was placed before you, is

the right that existed in the Saxonville mills to control the flow of the water in Sudbury river. When the city took that they took our property; they use the water or they do not use it; they took it through the channel or they took it through the conduit, it matters not, we can have no claim from that time; and the very argument that the gentleman used is conclusive upon this point, as are the authorities he cited. We cannot force the men who hold the reservoirs above us, we cannot force these men to let the water flow down; we cannot force the city to let any part of the water run in our channel hereafter; and if the argument, that the city was to pay only for the water taken, entered for one moment into the minds of either of you, gentlemen, it should be eradicated from the very bottom, for it is not what they have taken in the form of water, it is what they have taken in the form of right from which we have no appeal, and for which, gentlemen, you well understand we can never again apply for damages. If they take no water from us for forty years, what matters it; they have taken all our right to it. Again, what have we to do with this remote doctrine of capitalization, cited from the English engineering books? Do we need it? Cited from Dilworth's arithmetic would be as well. It is all aside and remote from anything we have to consider. Why, look at the position the Saxonville mills occupied when that paper was filed, and see what it was compared with that they occupy now; for the difference between the two positions you, gentlemen, are to assess the damages, fix the compensation, all covered by the expression, "make good the petitioner." I should feel that I had no right to encroach upon the intelligence of you, gentlemen, by argument on this subject, if I had not the eminent example of the gentleman acting for the city, who has pressed this theory upon you.

I cannot conceive of learned counsel presenting a case, grave in magnitude, upon arguments, principles, asseverations of rules more futile or childlike. Why, gentlemen, what is this talk of the enormous increase of doubling capital? What is the enormous increase of doubling coal bills, not one in eleven years, but annually? They pay us to-day \$400,000; it becomes \$800,000 in eleven years; I agree to it. We pay this year \$25,000 for coal to supply the place of what they have taken away from us. In four years that is \$100,000, and increasing in interest all the time; and why are not we entitled to some consideration for what we are to pay, and its doubling capacities, as well as the city? In short, gentlemen, the dollar taken from our pocket to-day is a dollar that will double in eleven years; the dollar paid to us for

that by the city, would gain in our hands and double in eleven years; and that is just as broad as it is long, and the argument is simply vox et præterea nihil. It will be observed that, all the way through, the argument has rested upon what the city has taken in the form of water, and what it is worth to the city in that form. That must not be the argument. It must not be the foundation upon which the judgment stands.

To follow the argument of the counsellor further, and in its order, we approach, first, the question of Farm pond. We will dispose of it speedily. We have the right to the flow from Farm pond into Sudbury river by virtue of old rights in that stream. We have further the right as riparian proprietor on both sides of the stream, running from Farm pond, whatever right that is. Now, gentlemen, there are two views to take of that right. One is, what it may be in the abstract; second, what considerations may be urged to diminish the damages for interfering with that right, — and we admit they are many, - but if those considerations don't outweigh its value, then, when we are deprived of that right, we are entitled to compensation, and it is simply a question, not of law, but of fact; simply a question of damage. body doubts that as proprietor of the banks of that brook from Farm pond to Sudbury river we have a right, under the Mill Acts, to raise Farm pond. At the same time that we do it, we must pay the people we damage by so doing. Now, if it is worth more, if it costs more, rather, to pay the flowage damage than we gain by the raising, then our right is worth nothing; but, on the other hand, if we can raise Farm pond, pay the flowage, and have a profit to our credit by the proceeding, this profit we are entitled to.

One thing further concerning Farm pond, and no more. It is of value to control the outgoing of Farm pond for our needs. In days of high evaporation, it may be well worth our while to dam Farm pond sufficient to stop its diminution, to hold it back to its usual high-water mark; and for the destruction of that right we are entitled to compensation. In it all, gentlemen, there is no question of law. It is simply, what damages have we suffered? Well, now it will appear in the testimony in the Essex case that the surface of the water-shed of Farm pond is about two miles and a half. There is a value attached to the accumulation that water-shed affords and the distribution of that water so accumulated, and that value you, gentlemen, will adjudge. I have not thought it proper to introduce witnesses to speak simply of an estimate of damages in a matter where you, gentlemen, are quite as capable as anybody we could produce of judging. It has been the desire, on our part,

to vex you with no more testimony than was needed to sus-

tain our claim to the fair damages we are seeking.

Now, to come to the second main position taken by the counsellor for the city. The main question, propounded in words: "How do we injure the petitioner?" I venture a few remarks in regard to that. Firstly, as to the 1,500,000 gallons daily, that, under the law they are compelled to allow to run. You will observe that the certificate of taking, which is filed here, takes the whole of the water. I do not believe that it justifies the city in so taking, as to interfere with the running of 1,500,000 of gallons daily; and, as a matter of law, I would not urge that such was the true construction of But if, upon an examination of the document filed by the city, the commissioners are satisfied that the city may proceed to take the whole of the water, and not allow us this 1,500,000 gallons, then they will enter judgment accordingly. Then this would be to be considered: that if the 1,500,000 gallons are excluded, the damages would be very much greater; that the last 1,500,000 gallons are absolutely necessary to the conducting of any work at Saxonville, of the kind we are now doing. It is needed for scouring and washing; we saw, when taking the view, the need of this water for that purpose, and that 1,500,000 gallons did not run away any too clean, at all events. Therefore, if, upon examining that document, it should occur to the commissioners that, as matter of law, we are not entitled to insist upon the running of 1,500,000 gallons daily in the old channel, the amount of damages would be increased enormously. I do not believe that such is the law.

We then come to the next position,—one urged with very much more force; that they were to take no surplus when the water was at that state that it ran over the dam at Lake Cochituate. Why, gentlemen, it is not proposed to take the water to Lake Cochituate at all; and before the argument was closed, the gentleman announced that it was but a temporary connection, and the water was to run through the great conduit, and never to run over Lake Cochituate dam at all. And what becomes of that provision, and what becomes of the legal consequences that attend it, according to the argument of the counsellor? Why, this is the purpose of that clause in the statute. While the water is running into Lake Cochituate through the new channel,—through the channel that at the time the act was passed it was contemplated would first be made, — while it is running there, the city should not waste it, and they should not draw it from Sudbury river when it would run over the Cochituate dam; but if they do not take it to Cochituate dam, the whole force

of that argument and that section falls to the ground. Furthermore, suppose they were to run it through Lake Cochituate, what was the last grave announcement of the counsellor? That they were going to make us a little better off than we ever had been before, by building reservoirs that would contain and control the whole of this water,—never let it run over Lake Cochituate dam, control it far back. There is certainly a little inconsistency in urging

these two things to the commissioners.

Again, some authority and much able argument have been employed to show that this was a taking for a public use, and therefore not only to be treated tenderly by the commissioners, but to be treated under certain rules, that under this construction would take from private persons and give to the public, that already hath much. It may be taken for a public use. We yield for the moment all the learned counsellor has said. Is it not from the first line to the last of the statute accompanied with a provision that it shall be paid for? The taking for a public use has no other significance than that it clothes the parties taking with authority to take. It is one of the cases where one does not make a bargain. A private person cannot take your property without a contract; but in the exercise of the right of eminent domain no previous contract is required. It is allowed where the public use demands, and that use is one of the conditions upon which the exercise of the right depends. Therefore, when he speaks of this as being for a public use, and the counsellor endeavors to invoke your consideration, because it is, it is claiming no more than we concede by the petition; that it is a taking of this property under the authority of the Commonwealth, with a provision that when taken it shall be paid for; and it is the pay that we are now seeking at your hands.

Now, I come to something which seems to me to involve very much the same class of argumentation. That is, our right, so earnestly attacked by the counsellor, to damages or compensation for the value of our water-power for its use at night. We ask the value of that power. We own it, and I do not see that any law has been cited here which forbids you to give to us a compensation for its destruction. How you are to reach that compensation is entirely a different question; but that we are entitled to the full value of the power to use at night, nobody can doubt. Valuing it upon such conditions, and introducing such elements of calculation as you may, what it is worth, what the balance is of profit over expenditures, that we ought to have, and I do not see in the argument of the counsellor, or in the authorities he

has cited, anything that interferes with this claim; and we concede that we suppose the uses of the water by night are accompanied with some qualifications of the value of the use by day; but that is all. We could sell to a paper-mill; we could erect a paper-mill; we could employ that water at night; we have employed it at night, as we shall take occasion hereafter to show, by citation of proofs; and for that we wish you to allow us compensation. At that very point of his argument, your Honors will remember the counsellor was earnest in urging the early erroneous form of stating the question before you: We were not to be paid for the use of the water at night, because we were only to be paid for the ordinary use of the water as we then had improved it, and as the city took it. No, no; neither as the city took, nor as we use it, are we content to have our damages assessed; but as we owned and had the right to use it. The man who kills my horse damages me just as much, and will be mulcted as roundly by the courts, whether I use the horse day or night, or both, or not at all. It is the value of what we have, and what the city has destroyed, that must be assessed as damage.

The next position taken is, that we have only fifty horsepower at our mills during the dry months; and, to show this, the counsellor introduces a table to show the gradual increase of work done at our mills from year to year. I do not altogether follow out the mathematics or logic of the argument. I am sure it is an unsatisfactory method of showing the increase in production, embracing five different articles, year by year, for him to read down the column containing the product of one of those articles for a series of years. I read from the tables. In 1859 we made 104,000 single blankets, 70 odd thousand pieces of piece goods, 430,000 pounds of sale worsted, 288,000 pounds of yarns, and 135,000 pounds of box worsted. In 1875 (beginning now at the lower end of the column), we made 218,000 single blankets against 104,000 single blankets in 1859; we made 848 yards of piece goods, against 70,000 yards in 1859; we made 74,000 pounds of sale worsted, against 430,000 pounds in 1859; we made 181,000 pounds of yarns, against 288,000; we made 679,000 pounds box worsted, against 135,000.

Now, footing that up as the product of each year, it presents not altogether so large an increase production of the last year over the first. So with the rest of the table. I do not propose to occupy your time in going over each one of those lists. We have now, as we are informed by the witnessess, a few horse-powers, all the way from 25 to 60, — I think one of them said 50 or 60, — more than we had

in 1859. I do not think that it will be found that the product has increased beyond that, taking all the work together as shown by this list. If it has, I do not see that it bears very essentially upon the amount of water that runs in that stream, or was wont to run in it, before the city took it. I think that is to be measured by something very much more direct,—by testimony such as we have presented, and such as has gone in, in the Essex Company's case; very much more direct than the remote testimony gathered from results; results, too, which grow out of a stimulated condition of trade, or a condition of trade low, feeble.

Mr. Butler. How many blankets would you have made in good times, if in the year 1875, in a very depressed state

of trade, you made 218,000?

Mr. Hodges. That was the largest turnout but one. 1873 there were 1,000 more than in 1875. The stimulus upon a manufacturer to make depends measurably upon the state of trade, but it may depend upon his particular con-There are a thousand unknown conditions that influence a manufacturer in his trade, that do not relate to, or in any way expound, the power he is using. It may, however, be observed that in 1862 we report 92,000 blankets made, against 358,000 yards of piece goods; five times as many as had been made in any of the previous years reported, and very many more than have been made any time since. It would seem that the manufacture of piece goods in the years 1862, '3, '4 and '5, was stimulated beyond anything else. For instance, during the three previous years, there were 70,000 yards of piece goods each year, while in 1862, 358,000; in 1863, 191,000; in 1864, 320,000; and in 1865, 197,000. Then it falls down to 41,000; 50,000; 44,000; 51,000; 13,000; 5,000; 2,000; 2,000; 1,000; 800, — falling right away. This would seem to be the main increase of production occasioned by the stimulus of the war.

Commissioner Stevens. What do you mean by "piece goods"?

Mr. Hodges. I do not know. I assume that they were flannels and goods of that kind.

Mr. Butler. I should suppose that they were fancy

cassimeres or something of that sort.

Commissioner Francis. I suppose they call them "piece goods" to distinguish them from blankets; anything that is made in long strips is called "piece goods."

Mr. Butler. We call fancy cassimere, opera cloths,

and all that, "piece goods," and shawls, "shawls."

Mr. Hodges. The column of sale worsteds may be

instructive: in 1859, there was 430,000 pounds; in 1860, there was 396,000 pounds; in 1861, there was only 158,000 pounds. I think that may be explained. In 1861, the war broke out. Early in the year it was threatened, and it broke out in April, and articles of that kind, used in making carpets, were, of course, of very doubtful sale. I am only making such explanation as occurs to me. Perhaps I am led to it a little by what follows: 201,000 in 1862; 275,000 in 1863; 273,000 in 1864; 245,000 in 1865; 348,000 in 1866; 254,000 in 1867; 172,000 in 1868; 276,000 in 1869; 257,000 in 1870; 193,000 in 1871; 127,000 in 1872; 188,000 in 1873; 150,000 in 1874.

I notice that 283,000 pounds of yarns were made in 1859, with only 96,000, 75,000, and 44,000 in the years 1862, '3 and '4. The worsted yarns were, I suppose, employed for

substantially the same purposes.

It will be found that the amount of goods represented in the schedule presented to you would show no material change in the amount of power used, if you consider that in 1865 we introduced perhaps 50 horse-power more of machinery, and at the same time we added four feet to our dam, creating an increase of one-sixth of the fall; and that one-sixth represents more power than the increased machinery and increased

product would require.

In summer, the counsellor tells us, that we substantially quit using the water. The testimony we have introduced will, I think, clearly show the value of that statement. At no time during the forty years in which the history of that water-power has been presented to you, during no time in those forty years has there been water insufficient to carry Mill No. 3. I do not forget that the mills are shown to have stopped twice, only twice, since 1829; but at no time have the mills stopped for want of water to run No. 3, which took all the way from fifty to seventy horse-power. And, it will be remembered, when we were upon the view of this very property, the commissioners were told that there was then running about ten million gallons a day in the duct taking Sudbury river to the city of Boston. That ten million gallons a day is equal to about ninety horse-power for ten hours. Whatever it is, the commissioners will judge of it, and will understand it quite as well as I can tell them. There is to be added to that a million and a half gallons then running through the Saxonville dam, making from ten to eleven millions and a half of water then running in Sudbury river above the city dam. Now, from the last day of July to the day we saw that water running, there had been no rain equal to a good June dew.

There had been the whole month of August and that part of September, of weather unexampled in respect to heat, in the memory of any of us; and our brother Butler has told us that he and I are pretty old. There had been no rain, and an evaporating power, the like of which, for the same length of time, none of us recall. I do not think it is going too far to ask you to believe, that in the forty odd years in which that mill-power has been presented to you, there has been no time when there was not as much water in the river as was running the day we were there. So I say that we are not ready to admit that there has been any time, in a dry time, when there was not more than 50 horse-power there. On the contrary, we show, take one year with another, there has been an average all the time of nearer 100 horse-power, and never a time when there was not enough to run the little mill, as the little mill was then burdened.

I have thus, gentlemen, presented to you the views I entertain concerning the positions taken by the counsel for the city, and I come now to ask your attention to a few considerations (and I will not be very lengthy) upon our side of the case. The city has taken away from my clients property, owned and used by them, of very great value, and you are here to assess the damages. I will open the argument on behalf of the petitioners, at this stage, by saying that we claim that there is water-power there equal to 325 horse-power by day for nine months in the year, and a usage by night so added to that as to make a power equal from 450 to 550 horse-power for the year; and for that we claim our damages. It will be understood that, in a matter of this kind, we, none of us, have a right to speak with absolute assurance of certainty. We are dealing in all respects with quantities that must be varying and results that must be uncertain, when the test of figures is applied to them. We have seen experiments made by the best hydraulic engineers in the land, over a series of many years; and yet, with science and instruments and long perseverance, they tell you, and tell you truly, that they cannot state the exact result for any particular day or year, nor predicate from existing statistics results for the next year or series of years. We unfortunately have kept no records of the uses or amount of power, and I think the reason for it is obvious. The mill company owned all the power and used it whenever it could be used, and, when it could not, supplemented or supplied it with steam. And why should they spend, as the Essex Company has spent, \$40,000, \$50,000, \$60,000 or \$70,000 in keeping records by which to come to an estimate

of that power? We might have done it, and probably should, if we had supposed that the compensation was to be based upon that when the city had seen fit to take our property. We did not suppose that. We have kept no records, and, in the absence of records, we have brought to you the best evidence we could get, — the very best; the most intelligent men we knew, who had been longest upon that water-power and knew most about it, because it represented the work of their hands. They knew, because they used it and dealt with it. At the time of which they have spoken they knew more about it than anybody, and could each day have told you the measure of its power with about as much accuracy as any instrument. We now present the aggregate of their recollections.

We claim here damages of perhaps three kinds; and I would dispose of the two lesser in importance before urging what we all recognize as the principal subject of damage. The value to the Saxonville mills of the right to flow back as far as the present dam flows is an important right, in connection with the right of the corporation to the power, because it is the source of the power. The injury done to us by taking that away, and leaving exposed 100 acres of marsh and swamp, is a damage of another character and quality; laying bare 100 acres of land, that is to throw out for all time malaria and disease, is a matter of serious consequence to the industry of that village, which consists in the industry carried on in these mills; of serious consequence to the owners of those mills, as it diminishes the attractions of the place to the operatives, causes higher wages or less efficient assistance; an injury appreciable, not measurable; an injury directly resulting from what the city have done; an injury that we have no means of preventing. The water the city gives us will not fill that up and protect us, and our condition is exactly a pitiable one in that respect, in view of conducting manufacturing operations hereafter, under the power which we can afford to supply. Now, as that diminishes our estate, so we are entitled to compensation for it; I grant, a compensation which it will be difficult to arrive at, as it is difficult to arrive at damages to character, or damages to beauty; but nevertheless, as the jurors judge, so the damages are. The same thing may be said with regard to the influence of taking this water away upon the village. Look at it. Anywhere in the wide world we can take coal and build a manufacturing establishment, and draw around us operatives, and do very well; but is there any place as good as one where there is a good waterfall? The gentleman tells us, "Supply it with steam; never mind

water; supply it with steam." You can supply steam where there has never been any water-power; but if you have water and supply steam, you have two elements of wealth. And it must never leave the minds of the commissioners that in all this time we are seeking compensation for taking the whole of what we had. We stand very differently from many of the parties below us. Take the case of the Essex Company, for example, where a fraction of their water is taken; but they have a vast quantity left for certainly many of the purposes of water-power. We are absolutely drained; not enough left for the ordinary purposes of cleanliness. Enough left to wash the wool, but not enough left to keep the soil wholesome. Now, the influence of this is a matter which, while it cannot be measured with accuracy, does sound in damages, and may be measured proximately. cannot tell you in figures that it should be so much, nor, when you have made your judgment, can you say, "We know this is absolutely right," but you can say, "It is as near as we can get to it;" and we ask that you should give us such damages as you deem just for the injury sustained in these respects.

Again, to us there was a value in the right to set back the water from the grist-mill. We had a right to keep the gristmill dam as it was originally, six feet, now a foot and a half or two feet above the top of the water, as it is set back by the lower dam. The height of that dam was in other days important to us as keeping back the water, and enabling us to employ in the day what was thus kept back at night. That is made useless now. The argument that we are not to be paid for that, as well as most of the argument that has been made upon the subject of payment, is not unfairly to be compared to the argument that I have heard made in this manner. "Why, the value of a gallon of water to the City of Boston is what we are to pay, that is all." Then, would they not do as well to take the gallon of water below our dam as above it? All they get is the gallon. Why not take it below our dam, and not do us a mischief? They saw fit to take it above, and now they must pay us for the value of that water up there. And, still, it is only a gallon of water. It is only such a mass of particles of moisture. I am unable to see wherein this has not, not only an appreciable value, but one for which we are justified in coming to you for payment, and should not be justified in not demanding that it shall receive your earnest attention, and take its place in the catalogue of

actual damages for which we are to be compensated.

We come, then, gentlemen, to the substantial question before us: what damages are to be awarded to us for depriving us of the power the water previously afforded? And there, once for all, I would say, that I leave with you to judge the value of the fall at the grist-mill as power. I have spoken of its value in another respect, but as power. And when you estimate the amount of power there is below, you will have before you the means of estimating with accuracy the value of that power at the grist-mill. Applying such rules as you have for estimating power, and fixing, as you will do, the amount of power at the place below, you will have the formula by which you will estimate the power there. And that brings us then to the manufactory dam.

I have made some calculations concerning that power, and such figures as I have made have been based upon the theory that the dam was twenty-six feet. My figures are not numerous, but whatever they are, they have been based upon the theory that the dam was twenty-six feet high. Mr. Frizzell puts it at twenty-five and a half feet, I think; but he takes it from the top of the flash-boards, and does not include the fall below. So that I believe we shall find, in making the estimate, that twenty-six feet is a fair estimate of the height

of the fall.

Considering that that is the basis, the next question is, how much water passed over? And that, your Honors will say is the critical question to be dealt with. How much involves time as well as bulk. One of the elements of horse-power is time, and in this respect, and in this inquiry, so far as we are concerned, we shall treat the subject by horse-power. The testimony before us seems to deal with that in perhaps three sections. Speaking more strictly, possibly it would be reduced to two. But we shall ask you to consider the questions; they will be gathered under these heads:—

First. What does the scientific testimony establish as the

measure of that water-power?

Second. How shall we measure it by the phenomena that are to-day visible?

Third. What measure shall we fix to it through the testimony of witnesses looking back over the past?

That will be the manner in which I shall endeavor to represent that branch of my clients' right.

[Adjourned to Friday, at $9\frac{1}{2}$ o'clock.]

FRIDAY, Sept. 29, 1876.

Mr. Butler. I desire to call the attention of the commissioners to one point made by the gentleman on the other side; that is, that in drawing off the water from the Sudbury river above, we may so diminish the amount of water on the lands adjacent to Saxonville, as to injure the health of the village, and so depreciate the value of property in the village. That is, as I understood, his argument. I do not want to make any observations on the question of fact, but simply to state my views of the law, —that that is not an element of damage which you can estimate. If we do that, we shall be doing a public nuisance, which would not be permitted for an hour; and it is not to be presumed, that in using our rights under the act to supply the City of Boston with pure water, we are going to commit a public nuisance and injure the public health; and therefore the people on the line of the river can have damages for that injury. will be two reasons for it: first, being a public injury, an injury to the public health, nobody can have a private right of action, unless he has some special damage, differing in kind, not in degree, above every other inhabitant of that village. Second, that it is not a necessary consequence of taking the water in a proper manner, and it is not to be presumed that it will be taken by the City of Boston in an improper manner, deleterious to the public health. The principle that you cannot have a private action for a public nuisance is settled in the case of Howard and the Locks and Canals, against the Lowell & Nashua Railroad.

Mr. Hodges. If the property of the Saxonville Company is injured by the exposure of the bottom of the pond, they should be entitled, under the great rules of law, to compensation, whether the act amounts to a public nuisance or not, where the taking is associated with other actionable injuries committed in the act of taking. I am aware that the act of a trespasser or wrong-doer, or persons wielding eminent domain, if it amounts to a nuisance, may be remedied by the common forms of procedure provided by law; but I am not aware that where the law gives parties a remedy for a specific act, though that be done in the exercise of eminent domain, the injury arising from that is not to be grouped with the other injuries for which the statute provides — the very statute relied upon in this case which transfers the authority

from the direct custody of the Commonwealth, the sovereign, to the party whom it has authorized to wield this power.

That would be the first answer I should make to the proposition of the counsellor. The next answer I make is, that this is a special injury. They take the water away from the Saxonville Company, and in so doing lay bare its lands, and poison the atmosphere of its adjoining property. The books are full of cases which show that if we do not now

receive compensation for that injury, we never can.

Before entering upon the remaining and substantial argument which I desire to make in this case, and which I marked out to your Honors last evening, I am warned that it is possible I have not, with sufficient clearness, stated a proposition of law of some consequence; consequence, I must admit, enhanced, if not absolutely created, by the importance attached to it by the counsel for the city. I refer to the question raised by the counsel concerning the intent of the Legislature upon the question of damages, and in respect to the prospective taking by the city, from time to time, as the needs of the city hereafter require. And the form in which I should state our proposition of law would be this: The Legislature considered that the whole value of the petitioner's estate or right is appropriated when the taking required by the statute is filed, and when the water or any part of it is first diverted under the act; and so far as you, gentlemen commissioners, are appointed by the Court to deal with this subject, you are to consider it and to estimate the damages according to that proposition. Let us for a moment consider that proposition as applied to the condition of things now at this juncture under consideration. The city have offered no proof of any purpose to delay taking the whole of that water, excepting a million and a half gallons. Had they offered proof, it would have been a subject of consideration, and possibly of contest, at the time; they have offered none whatever. Then the proof that is before us is a solemn decree of the City Council of Boston, announced through the Water Board, the parties designated by the statute to act in that behalf, that they "hereby take the whole waters of Sudbury river." No proof is made or indicated, qualifying the absolute and comprehensive character of the written terms of that solemn vote of the authorities of the city. Now, it strikes me, if we have any fact in this case that we may argue from with a certainty that it has been established, — it is the taking by the city of the whole water of that river. If we may be permitted to follow the counsel of the city into the field of conjecture a little way, we may well test the value of

what we have here proved. It is announced that it is doubtful whether this taking is the taking contemplated by the statute, and announced in the paper filed by the city, to which I have referred, because they have taken the water through the ditch cut in 1872, instead of through the brick and iron and granite conduit, a little more aristocratic duct through which to appropriate our property. They have taken it, but it is questionable whether it is a taking, because it does not run through the appropriate conduit. I do not answer that argument, because it is too trivial; but I will endeavor to improve upon it. Through the present ditch, all the water of Sudbury river, in an ordinary time, cannot run; when the conduit is finished it all can run. Now, suppose a railroad corporation files its taking of a particular piece of land, and then delays building over that land because the track has not yet come so far along,—are they to say that they have not taken the land? Are they to say that possibly they may never take it? Following again in this direction, are we to suppose that when the conduit is finished, and the City of Boston does not need for its sanitary purposes the whole amount of Sudbury river, A, B, C and D, in the City of Boston will not be willing to pay for the surplus waters of Sudbury river for mechanical purposes? We know they will. It is not in proof, but we all know that such is the purpose of the city, — to sell this water for mechanical purposes. And how, then, do we stand? The city does not wish to pay us for this water, because she does not need it at present, and the argument to you is, that until the city increases in population very materially they will not need it, and so the water will continue to run in Sudbury river. But when you have rendered your judgment, and in that judgment have considered this fact and diminished our damages because the city were not now prepared to take all the water, suppose the city should finish the new and enlarged conduit, open the gates, and take the whole river and sell the water that they have not paid us for, your judgment justifying them in not paying, they sell that very article to any person who sees fit to buy it to use in the City of Boston for the very purposes that gave it a value to us. When the whole of this is done, and we then come forward and apply to the Court for a further assessment of damages, and show by you gentlemen, and show by all others, that we did not have awarded to us the proper amount of damages, because, when we were before you, you were made to believe that the city did not intend to take the whole of that water for forty years, and so you rendered us diminished damages

(as you certainly would if that was a legitimate view of the case), the Court would put its hand upon our application. deny our right, and say to us, "You sought damages before a competent tribunal; they have given you damages, and that damage covers the whole claim for the whole of the transaction." We should get no more, and the City of Boston would appropriate to its treasury the avails of the sale of this very water for which you have not allowed us, and we have never received, compensation. Such is my poor reply to the positions and argument of the counsellor of the city. I now return to the main claim of the petitioner.

This case, gentlemen, is one of very grave consequences. Few of us deal with questions involving more money in any form in which questions come before judicial tribunals, and if I delay you, if my argument extends to tediousness, it will be only because I feel that the interests of my clients are of such magnitude that I must waive any desire of my own to relieve you, and devote such energies as I have to their protection. The subject, as I left it last night, was this morning to be considered in three aspects before approaching the figures of damages. I was to ask you this morning to hear what I had to say upon the subject, first, of the scientific proof before us concerning the amount of power created by the river at our dam. Secondly, that quasi scientific proof that is involved in the present phenomena that have passed under your personal observation, or been presented in proof before you; and, third, to consider the testimony of witnesses speaking from memory, and tendering to you their judgment concerning the amount of that power. the discussion in these aspects I now invite your attention, and I will endeavor to make my statement as brief as the case will permit.

And, firstly, it will be obvious, that the tests of science in this case can be most appropriately, and perhaps exclusively, applied through an examination and estimation of the watershed. There being no measurements in our hands for a series of years from which we can state to you the exact amount of water or approximate the amount of power, we must necessarily turn to the water-shed as the basis of all our scientific calculations. You will have observed, gentlemen, and I desire you should consider that feature of it, that the water-shed in this case is embraced within the ridges or "divides," as they are termed in some parts of the country, which turn the waters on the one side into Charles river, and on the other side into Sudbury river; at the extreme sources, on the one side into the Blackstone and the other into the Sudbury, and on the north, the one side into the

Assabet, and again into the Sudbury. Whether at the extreme northwest there is an interlocking of the waters of the Nashua, running around the sources of the Assabet, I cannot say. I do not think there is. Embraced within that is an area of 73 square miles. It is called by some of the witnesses 72.3 miles. The city speak of it in the report of 1872 as 73 miles. In another place, it is spoken of as 72, excluding the water-shed of Farm pond; a ring within a ring. Those 73 miles we shall take as the basis of such small calculations as we have made, and the witnesses have presented. The witnesses certify that its qualities of retaining and disbursing the water are of fair average of the other water-sheds in the vicinity. It is proper to say that I refer to the water-shed above the city dam, not to anything below. It is admitted, and it will so appear on the 71st page of the report of the Essex Company case, to be a water-shed of fair average quality in respect to its capacity for retaining

and paying out the water received.

The next aspect, and the most important one, in which I wish to present this basin, is the amount of rain which may be calculated upon to fall within its borders. Now, so far as we are concerned, we have no rain-gauge, and know of none kept above our dam. We have, and it is in evidence here, the rain-gauge of the city, taken nearest this point, which we shall present to you. That rain-gauge is kept at Lake Cochituate, and our position, first, in respect to this matter of rainfall in that district is, that the records of the rain-guage at Lake Cochituate are to govern entirely and exclusively. It is within the same water-shed, it is subject to the same climatic exigencies, the same topographical influences, the same currents of air and of electricity, — all of which control and command, to use the stronger word, the rainfall of the Cochituate basin. That one rain district differs from another, - differs from another marching with it in boundaries, - we all know. It is not for me to tell experienced gentlemen that the rainfall in one water-shed differs essentially from the rainfall in another adjoining. Perhaps the most remarkable instance that we have recorded is that on the western coast of Norway, where on the one side of the hills the rainfall is about eighty-two inches per annum; on the other side (the east side), within a rifle-shot, it is about forty-two inches, - almost double in the one case what it is in the other, — and with the varying changes that obtain in every district that will be the average for the whole of the century. The same thing occurs everywhere, differing in degree. Now, in the absence of all other measurements, we are justified in asking you to assume that that rain-gauge, as kept by the city, by men whose abilities, exercised under circumstances to bring those abilities out to the utmost, has been well kept. And we shall act with the assurance that it is an established fact that the rain-gauge of Lake Cochituate is the rain-gauge that governs this basin and controls our calculations.

By that rain-gauge, found on the fiftieth page of the report of 1876 (it is matter that has been put in), beginning with 1856 and descending for twenty years to the present time, the average rainfall is 50.19 inches. I refer, in support of this, to Mr. Mills' statement on the seventy-second page of the report of Essex Co. case. Assuming that to be the rainfall in this district, our proposition is, and we shall endeavor to maintain it, that the produce of that district will be 334 horsepower exerted all day for the 313 working days of the year. I have made a statement of that, which I will read with the view of illustrating the proposition that I insist upon. theory advanced all the way through this case has been that for each square mile of water-shed one cubic foot of water will be delivered to the mill upon a rainfall of forty-three or forty-four inches. Such has been the calculation, made upon such a rainfall in many of the districts, and such is the statement in the city documents. Now, if 44 inches will give to the mill one foot of water, 50.19 inches will give, not probably six inches more, but will give more than the proportion existing between twelve and forty-four inches; and the reason for it is obvious. There are certain demands upon the tall of rain that must first be exhausted; the soil and the sky will take so much, evaporation and absorption exact so much, without any regard to the rights of the mill-owner, and it is understood that of the forty-three or forty-four inches average rainfall in the great district that was under consideration the other day, this amount, to wit, about thirty-two inches, will be exacted by the soil and the air, leaving twelve inches for the river. When the soil and the air have been satisfied, then come other rights. Now, the soil and the air have taken most of the forty-four inches; and, being first served, their demands have been substantially satisfied with thirty-two inches. I believe, then, it is fair to say, that, if in a rainfall of forty-four inches the millpower gets one foot, in a rainfall of fifty inches the millpower will get sixteen inches. The learning and experience of this board will correct me if I am wrong, but I believe that this is a fair calculation. However scientific may be the witness or the party, we are all of us dealing here with unknown quantities, and cannot assert absolute results; or, if we have known quantities, they are presented with varying conditions which qualify the results to an equal extent that would be done if the quantities were unknown. In this view, if this is not a fair and candid calculation, I shall cheerfully submit to the correction of those whose judgment and learning far exceed mine, and who stand in no position

of prejudice.

If I am right in this basis of calculation, the proposition would be stated something in this way: Seventy-three square miles, one foot to the mile, add four-twelfths of a foot for the rainfall exceeding forty-four inches, and we should have in that district of seventy-three square miles ninety-seven and one-third cubic feet per second. That would yield two hundred and eighty-seven and one-half horse-power per day of three hundred and sixty-five days, or three hundred and thirty-four horse-power for three hundred and thirteen days in the year, counting all that time the uses of power in the day-time not kept back at night. Our night work we propose to deal with hereafter.

Thus, gentlemen, we assert as the first member of our proposition, that fair calculations entitle us to claim that 334 horse-power is the measure of the water taken from us by the city. Perhaps it is fair to say now that our claim extends to but three-quarters of the year. Let that be understood all the way through the case, and save any restatement. I desire to state our propositions fairly, and to prove them

fairly.

I now ask your attention to a second form of proof, which I believe confirms the statement I have made. The Wamesit dam, in a dry time, says Mr. Mills, shows from 40 to 55 cubic feet per second for the Sudbury river. "This is in a dry time," - repeated by the witness. Now, if we take as a mean and say 50 feet per second of Sudbury water, in a dry time, falls over Wamesit dam, let us calculate from that, and see where we shall come. That will produce 1721 horse-power per day of 24 hours, calculating 313 days in a year. On the 87th page of the Essex Company case, Mr. Mills says, in answer to the question, — "Do you believe there is as much water comes down from the upper Sudbury river to the Wamesit dam, as there would be in ordinary streams, taking into consideration the meadows?"--"I don't believe that the same water that starts from the upper Sudbury, — that so large a proportion of the same particles of water that start from the upper Sudbury, - gets to Wamesit dam as if there were not a larger than usual evaporating surface between the two." Further on he says, that there would be about 200 cubic feet, from that to 225 cubic feet per second, arrive there, including Assabet river, - including the

whole. On the 90th page he is asked, "Well, what proportion? How much?" and he says, "Well, I have no question that there is, after the taking of this water from the upper Sudbury, sufficient water coming in to supply evaporation, and for all wastage in the territory below, so that the cutting off of this upper Sudbury water would be a reduction of the quantity at Wamesit dam, or at Lawrence, by just the amount of water so cut off.

"Q. I suppose that is so; but what I want to get at is, 'how

much?'

"A. Oh, the yield of the upper Sudbury is about 40 to 55 cubic feet per second, in a dry time.

" Q. That is for the whole 24 hours?

"A. Yes, sir.

" Q. And by a 'dry time,' do you mean the ordinary dry months of the year?

"A. Yes, sir, that is, that would be the smallest quantity

that would be derived from that river."

Now, gentlemen, in a very dry time, the dryest time, for a brief period, 40 to 55 cubic feet runs in the Sudbury river, or, as Mr. Mills expresses it, "reaches Wamesit dam." I take it, if we can rely upon the understanding of any scientific gentlemen, in respect to hydraulics, it is Mr. Mills, when he has had an opportunity to examine; and if we can rely upon the sensitive truthfulness of any witness, we can upon Mr. Mills, and his testimony would give us all that we claim. That is, it would give us, in the dry time, 172 horse-power for 12 hours of the day. It is more than we have asserted we have; and I believe we always have that; but it is more than we have endeavored to establish before you as our claim; for it will be remembered, that this is after all the evaporation of an evaporating surface, certainly exceptional. Sudbury meadows have vexed the Commonwealth for half a century as the receptacle of the waters of Sudbury river; Fairhaven bay, and the other extended parts of the river, expose an evaporating surface certainly not usually found. notwithstanding all that, and all the wastage, this is the opinion of Mr. Mills, as to what comes to the Wamesit dam. And the result of that is, if you take Mr. Mills' statement, that 172 horse-power of water runs over our dam every day in the dry time. If we start with that, using that only in the dry time, your Honors will observe that it would give us $244\frac{1}{2}$ horse-power per day, employing it only 12 hours per day in the dry time.

These two branches of evidence we have cited to you in support of a theory, because they present all that we have, in the nature of scientific test, with which to aid you in your considerations of this question. We are unfortunate in not being able to present to you tests such as appeared in the other case; but you will readily see that our power is not sufficiently large to justify the expenditure such experiments demand, and, certainly, when there was no call for it.

The second branch of our proof, which is to be derived from observable phenomena to-day, I took occasion to allude to in the remarks made yesterday; but I will again, and more in detail, refer to it. Upon the view we took early in the month, we were told that there were from 8,000,000 to 10,000,000 gallons running, at that time, in the sluice. Add to that a million and a half gallons, running in the river, and you have, I say, 11,500,000 gallons running in Sudbury river, at the time of our view. That would produce 60^{2} horse-power per day of twenty-four hours, or 1201 horsepower during a day of twelve hours. Now, I need not repeat that that was as dry a time as any of us remember. I need not further repeat, that the estimate was made by the eye; and yet, with all that, we find that for the day there was running sixty horse-power. If your Honors will do me the favor to bear that number in mind, we may have occasion, as we look at the oral testimony introduced to you, to admire a coincidence in the figures.

Bear with me. I now ask your attention to the third branch of this proof that we have introduced, to establish the quantity of the power the City of Boston has taken from

us. In this, I refer to the testimony of the witnesses.

First, consider the proof before you of the machinery, as it is now in the mill, and as measured by Mr. Webber. We take this as the basis upon which our calculations are made, and as supporting the proof that follows. He says, that in the mill No. 1, there is 240 horse-power; in mill No. 2, there is 85; making 325 horse-power. I leave out the fractions. Add to this, machinery amounting to ten horse-power in the basement of mill No. 4, carried by the engine, that Mr. Webber did not measure; and, in support of this, I cite as authority Mr. Hill and Mr Webber both. That makes ten more horsepower. Thus giving, as the sum of the horse-power required to move the machinery in the mill, 335. This is about fifty to seventy-five horse-power more than was used in 1830, and from that time to 1844. In 1830, the mills were running, and the testimony shows us that fifty to seventy-five horsepower was then used less than is now used. All the witnesses—French, Gibbs, Carter, Watson, and Hill—set it at about that.

Mr. Butler. Do you understand that your engine of 1844 ran all your mills, except No. 3?

Mr. Hodges. No, sir; it was not attached to No. 2 at all. It neither ran No. 3 nor No. 2.

Mr. Butler. Well, did it run No. 1?

Mr. Hodges. It did run No 1.

Mr. Butler. Eighty horse-power now, and it took

ninety-two to run No. 1?

Mr. Hodges. I think we shall get along with that. It does not trouble me any. To answer that now, it was an engine, rated at eighty horse-power, but doing an enormous amount of work, running that mill, and running a little more than that mill. It was an English engine, the first one that they had, and of extraordinary capacity. I rest upon the testimony of these men. Nothing has been introduced to qualify it, and it is not only unanswered by the counsel, but it is unshaken in any sense as to either its credibility or capability to pronounce upon that question. Now, in 1844, they put their first engine into the mill. Down to that time the machinery, fifty to seventy-five horse-power less than we have now, was run by water. We have since added to the power four feet of head. That much, then, compensates the difference in the amount of machinery run at that time and now. We say, then, that we are justified in stating as proved that the mills, as the water stood in January, 1875, were carried by a power of water of 335 horse-power. We next say that that machinery, 335 horse-power, has been run, upon an average, nine months in the year since 1829; qualifying the expression only by the difference in the machinery used at the different dates. We have shown to you witnesses familiar with the mill, in charge of the whole, or of special departments in it, beginning with 1829. They all tell the same story; — the difference between the views entertained by the counsel for the city and those that I take, and that I supposed were taken by everybody, concerning the common phenomena of memory, is very great. My impression has always been that it was the exceptions that burned into the souls, and made their impression, while the ordinary events passed along unnoticed. The sun rises and sets, — the days come and the nights come and memory makes no mark and takes no note; but the eclipse that comes we remember. The comet that visits us we remember. We do not remember the other 364 days. We do remember from this time back to childhood the days of the eclipses, and they seem to be more and more fearful as we look back. Now, the dry times were exceptions, and particularly the times when the mill did not run. And what have we got to say about the fifteen years of the history of those mills that we have presented to you, when they had no power except water-power

to run by? We have this: it is absolutely proven, and absolutely true, that in that fourteen or fifteen years, between 1829 and 1844, there are but two periods when the mills stopped at all, and these stoppages measured by two or three weeks each; and then there was water enough to run mill No. 3. They did not run mill No. 3, for it was a preparatory mill, and why pile up a quantity of prepared material without means of working it up?

Now, this is what the witnesses say. A fact, perhaps, speaks louder than all the voices of the witnesses. After the dry time of 1843, they went to work and put in the engine, — the first time they had ever thought it necessary to have any other power there than what was supplied by the

river.

For fifteen years the money of these people had been paid out to run those mills. Through the terrible crisis of 1836 and '37, those mills had run, and run by water; but in 1844, after a dry time, it was found necessary that they should have another power. The Cochituate rainfall, as reported in the books, does not extend back of 1852, if I remember rightly; but I take what I have before me—the Lowell waterfall. In 1843 it was 39 inches. In 1842, 38 inches, and in 1844, 35 inches. In 1844 it was 36 inches at Waltham: a time the witnesses say, so dry that they remember it. Until then there had been no occasion for an engine, and down to that time there had been no stoppage of the mills, save on the occasions I have mentioned. For that fifteen years the machinery demanded about 275 horse-power. That is not the only thing we are to observe. It was carried by three breast-wheels, one for each mill, a vehicle of power bearing about the same relation to the turbine wheel that a sun-dial bears to a chronometer as a measurer of time; and yet for all that the mills ran continuously, and never stopped save on the two occasions I have mentioned.

Mr. Butler. Which do you think the most accurate,—

the sun-dial, or the chronometer?

Mr. Hodges. I should stand by the chronometer, for fine measure.

Now, passing away entirely from calculations made, or estimates made, through the medium of fixed facts, let us see what impression was left upon the minds of these men; how their lives have received the impression created by their labors in this mill; for the half dozen men we have produced are men whose active lives have been passed in connection with this water-power, guiding it and receiving aid from it; and what do they say? Not, what does one of them say; but what do all of them say? Why, from eight and a half

to nine months in the year, all these mills could run by water, and that there was never a time when No. 3 could not run; and, as a general thing, it came to about this: all the mills were run by water about eight and a half months in the year to nine. Then No. 1 was taken off; No. 2 was taken off, or put on, as the water permitted, or it was relieved by taking off a little machinery, as the business permitted, and run off and on during the rest of the year. No. 3 could run all the time; in a portion of the remainder of the time after the $8\frac{1}{2}$ or 9 months No. 2 could run; all could run for eight and a half to nine months. Now, gentlemen, these are men whose business it was to know every day about that power. The weaver felt the looms in doubtful motion. carder complained if his cards did not move with the proper energy. The spinner knew if his drawing-frames flagged. Every one of them intended to and did watch and understand how the water was imparting vitality to his machine. In addition to that, three of them were practically superintendents of the mill, — Carter having it entirely in his charge.

Now, gentlemen, I can only say, that if a fact can be established by human testimony, it would be difficult for me to point out a means of proving more conclusively than we have done by these witnesses what that machinery did under the power of this water; and, I take it, what it has done it again can do, or could have done, if the city had left the stream in its natural channel. When we show what this water has done, acting upon our machinery, we shall at the same time show conclusively to your minds, the power they have deprived us of. And that has been our purpose in this, perhaps tedious, but certainly earnest, effort to bring before you

the full facts.

But we are told that the coal record is an important item; that it is against us, and tends to show that the views we have presented in this matter, are not sound. To a certain extent I should agree with the counsel for the city, that the appearances are, if unexplained, against our view. I think I shall show that it is not so in reality. In 1871, of his own motion, the engineer commenced to keep an account of the days when the mills were run by steam and water respectively; and he continued that account down to this time. Those tables will be before you, so that I need not detain you by reading them. I will only refer to them to say, that mill No. 1 was run, beginning on the 17th of June, 1871, 115½ days by steam during that year, 84¾ days during the year 1872, 111¾ in 1873, 147½ days in 1874, and 157½ days in 1875. Mill No. 2 was run 91 days in 1871, 138¾ days in

1872, 98½ days in 1873, 112½ days in 1874, 135½ days in 1875. In this record for the year 1871 there is an error in the footing of 2½ days for both of the mills. Each of the mills was run 2½ days more. It will be, I think, of no consequence in the figures I shall present hereafter, for I have cast out that year in the calculations to which I shall draw your attention; if I see clear through, it will not be in any respect qualified by that omission. My calculations employ both the record of steam and water work, and the record of rainfall for the four years ending December 31, 1875.

For the year 1871 the rainfall was 45.39; for the year 1873 the rainfall was 45.43. The calculations I am about to present to you assume as one of the conditions the rainfall, and, as record of steam and water for the year 1871 was kept only for the last portion of the year after June, I have substituted the rainfall of 1873 for that of 1871,

assuming that it was substantially the same.

Mr. Builer. If I understand you, in your calculations you take the whole rainfall for the year, — not for the sum-

mer months merely?

Mr. Hodges. Yes, sir, I take it for the year. I am presenting these calculations with the view, first, of correcting that record of water and steam. In sheet No. 1 [see Appendix "A"], that I present, I have stated in one division precisely what is stated in the steam record. In another, I have stated the days the mills were run by water, which the witness referred to, and which I have here for each year. In sheet No. 2 [see Appendix "B"], I have reduced the days that the mills were run by steam and the days that they were run by water, so as to represent the power in horsepower. To illustrate what I mean, mill No. 1 requires 240 horse-power to run the machinery. It ran in that year so many days by steam. I have multiplied the days by the horse-power, and have said that makes so many horse-power for one day that year, or so many horse-power that year. For mill No. 2 the same. I have then done the same by the water-power, and the results I have stated on sheet No. 2, beginning, however, at the head of the sheet, with showing that both the mills, running 313 days, would exact 101,913 horse-power one day. That would be the amount required to run them for 313 days. I have then gone through a series of calculations which show the results, beginning with 1872, but subsequently correcting the records, so that we have 1871, desiring to present to you calculations embracing those five years. In the year 1872 I find that we used by water 61,000, and some more, horse-power, and with steam we used 32,000 and some hundreds, making, as

represented, only 93,000 horse-power that year. In the year 1873, by the same course of calculation, I find we used 65,000 horse-power by water, and 35,000 by steam. In 1874, 54,000 by horse and 45,000 by steam. In 1875, 44,000 by water and 49,000 by steam. For 1871, I repeat the figures of 1873, making 65,000 by water and 35,000 by steam. With the single exception of supplementing the year 1871, so as to make it a full year, my figures are only direct results from the figures presented in the steam and water record. Sheet No. 3 [see Appendix "C"] explains the corrections and statements. Item No. 1 is simply a statement of the substitution of the figures of 1873 for those of 1871. Item No. 2 shows matter that requires more explanation. It refers to the calculations made for 1872. In the year 1872, it is in evidence that the city took 1,676,000,000 of gallons in the course of seventy-five days. Your Honors will observe that that 1,676,000,000 of gallons of water was taken from our water-power, and that we were obliged to substitute steam-power for it. Therefore it is fair for the purposes of the estimate that I am subsequently to call your attention to, that that water-power, properly calculated, should be added to the water-power we did use that year, and subtracted from the steam-power we used. I have made that calculation, and it amounts to 102 horse-power per day for the seventy-five days, or 7,650 horse-power for one day. That 7,650 I have added to the water-power, as entered in sheet No. 2, and deducted it from the steam-power there entered.

In 1875 the city took from us 2,500,000,000 gallons and over in 143 days.

Mr. Butler. When was that put in evidence?

Mr. Hodges. All along, sir.

Mr. Butler. I do not so understand it.

Mr. Hodges. Certainly it was, and you yourself spoke of it at the time, and it was admitted that the statement of those figures should go in, and the very figures were put down. You will find by the record that it is so. I was careful to have it put down, and it appears in all the reports. I do not believe it is worth while to go into discussion about that.

I have in precisely the like manner estimated the power that that 2,500,000,000 gallons would give us, have added it to the water record of 1875, and deducted it from the steam record, and have thus corrected the record of the engineer, so as to make it a correct statement of the power that existed for us then to use, having in view the calculations which I am now about to present to you.

Mr. Butler. But this water of 1875 was taken out in the wet season — taken in January.

Mr. Hodges. From the twenty-first of January to the eleventh day of October. Whether that is in the wet season or not, I will leave for the commissioners to judge. It struck me, as I heard the evidence, that a good deal of it was in the dry season. By the way, that will recall to you that it was put in. Don't you remember reading that paragraph from

the report? You read it yourself.

With these figures and corrections, I have presented in the last paragraph on sheet No. 3, a tabulated statement, in which the horse-power used by water in each of those years, 1871, '72, '73, '74, and '75, and the steam used in each of those years is entered, and this is the aggregate result for those five years. The water-power amounted to 308,999 and a fraction horse-power; the steam-power, to 178,052 and a fraction; the whole amounts to 487,067 horse-power, used by those mills in five years, from 1871 to 1875.

Now, gentlemen, turning to the fiftieth page of the city water report of 1876, it will be observed that the rainfall, as shown by the gauge at Lake Cochituate, for the five years beginning in 1871 and ending in 1875, was only 44.14 inches; beginning in 1866 and ending in 1871, the five years immediately preceding, the rain-gauge at Lake Cochituate shows 57.77 Now, I am not so uncharitable as to believe, that because in the spring of 1871 the newspapers and the officials began to agitate taking the water of Sudbury river, there was any tampering with the rain-gauge. It is not that. is not a variable temper on the part of the officials, but it is the variable character of the subject we are dealing with that produces a difference of thirteen inches in the same rain-gauge, in two different semi-decades. In the five years beginning in 1861 and ending in 1865, five years previous to the one when that water and steam record was kept, the rain-gauge shows 51.49. In the five years still previous, the third semi-decade previous to this steam and water record, beginning in 1856 and ending in 1860, the rain-gauge shows 51 inches.

Now, gentlemen, if there is any value whatever to the City of Boston in the production of that table showing the record of steam and water in our mills, for the period of five years, then we are entitled that the comparison shall be made with previous periods of five years, that we may see whether those five years are a fair average of the years that have preceded. We shall not be tied to those five years, any more than the city shall be tied to the five years next preceding, when the rainfall was $57\frac{3}{4}$ inches. We ask you to look over such a period as that, from your learning and experience you shall

be satisfied you are examining what is a fair representation of the rainfall for all time, as that rainfall is the exponent

of the power you are to judge of.

I have, therefore, gentlemen, in view of this, made on the fourth sheet [see Appendix "D"] a comparison of the power that our mill would have used in the five years ending in 1875, by water and steam respectively, if in those years the rainfall had been an average of the twenty years. Beginning in 1856 and ending in 1875, the average rainfall of the twenty years is 50.19 inches. But, first, I have made a comparison of what would have been the power we used, by steam and water respectively, if the rainfall for the last five years had been like the rainfall in the semi-decade, from 1856 to 1864, and after with each semi-decade to 1870. Not to weary you with details, but simply to make myself understood, I will say, that I have drawn the comparison in this wise: as 44.14 inches, the rainfall in the last semi-decade, is to 308,999, the whole water-power used in that semidecade, so is 51 inches, the rainfall in the semi-decade ending in 1860, to 357,000 and some fraction horse-power. So that we should have used, in the last semi-decade, 357,000 horse-power by water, instead of 308,000, and 130,000 by steam. In the next, when the rainfall was 51.49 inches, or, as I have measured it, $51\frac{1}{2}$, we should, by the same formula, have used 360,000 horse-power by water, instead of 308,000, as shown in the record. In the five years from 1866 to 1870, when the rainfall was 57.77, by the same mode of calculation, we should have used 403,937 by water, in the place of 308,000. Taking the whole of these together, and summing up the amount of horse-power used by water and by steam for the twenty years, as I have calculated it, and taking always the days of the last five years, when we had the record to go by, as the basis of calculation, I find that in the whole twenty years, if we had used power relatively to the rainfall, as we have used it in the years 1871 to 1875, our record would read, by water, 1,430,482 horse-power; by steam, 518,771; or, if the average rainfall for twenty years is taken as the basis of calculation, on the one hand, and the record of steam and water, as kept and introduced here for five years, is taken on the other, we should have run our mills $\frac{1}{15}$ of the time by water, and $\frac{4}{15}$ of the time by

Now, it is a curious coincidence, that carrying through a series of, to me, somewhat complicated calculations, we bring the figures to meet the evidence of these witnesses, who know more about this than all the rest of the world put together. There is no gainsaying the force of such coincidence.

It is not a matter that can be in any respect disputed or put out of sight. However large the result may be, and however exalted the persons may be who represent the city in the Council room below, the facts are established, and no

position and no results can displace them.

There is one piece of evidence before us in this case which seems to me to furnish some important information of the views we have expressed. It is a law in the courts, it is a law in the schools of logic, and it is a law in the commonest transactions of life, that the best evidence in the hands of a party should be produced; that the best evidence in the hands of a party not produced leaves to the opposition the right to say that the withholding of that best evidence, gathered during a series of years, under the stimulus of an excited controversy, and by the expenditure of unlimited means, would condemn the party thus withholding it. The City of Boston has been taking scientific observations of this water-shed and of the water of this immediate district. The public prints, the public voice, in every form, the written records of the city, all attest the extent and the depth with which this interest has seized upon the public mind. The archives of the city contain the results of those examinations. The leading mind that has controlled and managed those things from January to December, for five years, has been in our presence. If the testimony of our witnesses has had a tendency to create a false impression as to the amount and value of this property, why is not that testimony corrected by this higher authority? If the valuation we set upon this property is exaggerated, if the views we take of it are properly subject to sneers or ridicule, what means the silence of this witness, - of all these witnesses? Where are the records of the city? Where are the men who can tell a better tale for the city? They do not appear. We have seen nothing of them on the witness-stand. We should have been glad to have seen them. We should have been delighted to ask of the city authorities what their figures would show to be the value of the property they had taken from us. That is in their hands. It is not produced to you, and I leave you, gentlemen, to say why.

Mr. Butler. Everything we have got is in these reports. Mr. Hodges. That we know nothing about. We have had no testimony to that effect here. The man who knows it all has been giving aid to the city counsel all through the hearing, before us all the time, and not a word said by him in the capacity of a witness, under the sanction of an oath.

Again, gentlemen, I feel bound to apologize for the time I am taking, but it is of consequence, and I must ask you to

indulge me a little longer. Thus far, I have done nothing more than allude to the question of the use of this power by I wish you briefly to consider that subject. witnesses say this power can be used by night and day about two-thirds of the year; that it can be used as well by night as by day; and the reason for it is, that the pondage is so small above the dam, that when it can run by day, it can also, generally, run by night. We can keep the water back for a few hours, or even for a day, with the two ponds at the grist-mill and the factory. They not only have stated this as a theory, but have seen it in practice. All agree that during the war the mills ran most of the time, day and night. Mr. Watson, the oldest superintendent that we could produce, says that it was often during his time, between 1842 and 1860, worked nights; and always worked nights when the contracts required it. Now, we say that the testimony will justify us in claiming that the mills will run about two-thirds of the year; they will run eight and a half months by day, and about seven months by night; and that the night power is just as good as the day power. It has been used. It can be used. The right to use it at night is as valuable as that to use it by day, excepting always the difference in the expense. We could use it for paper-mills by night, or use it to compress air, for use in the day time, as was happily suggested by the counsel for the city. All these considerations fix a value upon the use of the power by night, and whatever it is, we own. Whatever it is, the city has taken away. We, the absolute owners, and in full possession of a power so controllable, and so by the expenditure of vast sums of money controlled, that one corporation grasps the river in its hands, and commands every particle of its energies from January to December, have been deprived of its power, and every farthing that that is worth, for use or for sale (whether used or not, or whether sold or not), we are entitled to receive at your hands.

We are told, in this connection, that "water is no better than steam; just as well use steam as use water." With water there to use, we can introduce a much larger amount, and a much different order, of work. At all events, we have the water, and it is not for me to tell you, gentlemen of experience, that a water-power is much better than a steam-power, when it is under control, as it is here. If not, if this is really a power that it is just as well to give up and employ steam, where is the common-sense of the corporation that preceded us, and the present corporation, who, having steamengines sufficient to carry their machinery, have put in four turbine wheels, at very great expense? Now, gentlemen,

we have given evidence of the faith that is in us. We took away the breast-wheels, and put in the turbine-wheels, after

we had the engine.

Now, gentlemen, I have stated a formula in respect to the use of this water by night. I made the formula before I had heard the testimony; for I have had no time since to make any, and it is probably open to some objection; but the principle upon which it is based is, I believe, sound. If mill No. 1, demanding 240 horse-power, ran nine months in the daytime and eight months at night, the result would be 517 days of running that mill every year, which would demand 124,080 horse-power for the whole year. Mill No. 2, running twelve months in the daytime and seven months in the night, would demand 48,065 horse-power per year. two together would demand 172,145 horse-power a year, which, divided by 313 working days, makes 550 horsepower required by our mill running day and night, as the water would run it. That, if I have stated it right, reduced to 313 days as above, would be equal to 550 horse-power for each day. Now these calculations I have made, and submit them to you for your aid. I believe they are correct; and when I opened the argument of this case by saying that we claim from 450 to 520 horse-power per day, I intended, as I then stated, to signify to you that our claim was thus qualified by the introduction of the power that could be used at night, and that it made a condition in our calculations of damages.

I have thus, gentlemen, in a wearisome manner, stated to you the views we take of the amount of power the city has taken away from the petitioner; the next and only remaining question for us to consider is, How shall the city com-

pensate us for the damage thus done?

Certain aspects in which the question of damages may be considered do not admit of compensation by supplying power. We cannot have power supplied to us to compensate us for the evil done by leaving bare our flats. We can have power supplied to us for the deprivation of our flowage, because that is involved in the calculations concerning our power and its value, and so far as involved it of course should not be considered independently of the valuation of the power. But the right to use the dam at the grist-mill for mechanical power has not in any degree been considered in the calculations we have made. The right to use the dam at the grist-mill, where there remains one and a half to two feet of fall for mechanical purposes, is not embraced in the other calculations; and whatever the value of a fall of a foot and a half, carrying 325 horse-power, for nine months in the year,

by day, and a corresponding portion by night, — whatever that is worth should be carefully estimated in the calculations, and allowed us as damages. And whatever the right of the riparian proprietor to raise Farm pond, and reinforce the flow of water, and thus augment the available power below, that likewise is not involved in the calculations of damages for the deprivation of our power. The mischief done by laying bare the hitherto covered portions of the large pond is not involved in the calculations of power. Those stand separately, and will be estimated separately, and form distinct items in the aggregate damages. I shall not weary you with further views on these branches of the subject.

Judge Story, in the case of Rogers vs. the Mechanics' Insurance Company, 1 Story's Reports, 303, remarks upon the subject of damages, which are in themselves incapable of

absolute ascertainment, in these words: -

"It is said that it is difficult and indeed impracticable to ascertain the true and exact value of the property in this case. There may be difficulty, and perhaps an impossibility, to ascertain its exact and minute value, for we have no means of weighing it in scales, or fixing its positive price. But the same difficulty occurs in many other cases of insurance; as in cases of injuries to sails, or rigging, or spars, by tempest, or by cutting them away, in cases of jettison; and yet no one doubts that they must be contributed for according to their value, ascertained by a jury, in the exercise of a sound discretion, upon proper evidence. Suppose that fruit is insured, and the vessel has a long passage, in which, by ordinary waste and decay, it must suffer some deterioration, and then a storm occurs, in which it suffers other positive damage and injury, or there is a jettison thereof; how are we to ascertain what diminution is to be attributed to natural waste and decay, and what to the perils of the seas? or what was its true value at the time of the jettison? There can be no positive and absolute certainty. The most that can be done is to ascertain, by the exercise of a sound judgment, what, under all the circumstances, may be reasonably attributed to one cause, and what to the other. Absolute certainty, in cases of this sort, is unattainable. All that we can arrive at is by an approximation thereto; and yet no man ever doubted that such a loss must be paid for, if it is covered by the policy."

The same rule obtains in all these cases. It is not that it is difficult, it is not that it is impossible, to ascertain with exactitude what has been the suffering. The suffering must be submitted to the best judgment of capable men, and their

judgment must be accepted as substantially correct, in those cases cited by Judge Story, as in the case we have before us.

These matters which we have submitted to you are evidently and eminently of uncertain ascertainment; but the main subject of complaint, the deprivation of power, can be with much more satisfaction arrived at. If we have, by the figures we have presented, pointed out the power we have been deprived of, or if we have pointed out a mode of ascertaining that power, correcting our figures by the judgment you shall form of the testimony, or, if there is in your minds one, or another, or another mode by which that power can be measured, then through some one, or more of these means it can be arrived at with sufficient accuracy; and when the power has been ascertained, it can be compensated for in a measure by substituting other power, and paying other damages.

Now, Mr. Bacon has placed before you his views of the cost of the engine and appliances, by which a like power with that taken from the petitioner may be put upon its shafts. We have had before us, in the Essex Co. case, an estimate of the cost per horse-power. On the seventy-fourth and seventy-fifth pages of the report, Mr. Mills makes his statement upon that subject, and concludes that it would not cost far from sixty dollars per annum, per horse-power. That is where the engine is prepared, a portion of the boilers heated, and an engineer and fireman furnished to attend to a portion of the work. Where all these are prepared, it will cost about sixty dollars, and he bases that upon coal at seven dollars a ton, the consumption at three pounds per hour, per horsepower.

Mr. CHILD. This sixty dollars includes the pay of the

engineer, etc.

Mr. Hodges. Upon his statement, possibly it does, but he does not say so in the opening; he says to the contrary. But I am not strenuous about that, because I think his calcu-

lation goes entirely aside from that.

Now, I wish to criticise Mr. Mill's statement a little. He estimates, firstly, thirty pounds a day, three hundred days in the year, where there are three hundred and thirteen. He estimates coal at seven dollars a ton. The last fifteen years will show a very different price of coal. Coal at Saxonville is over a dollar a ton more than it is in Boston, by reason of freight. Possibly I am wrong in saying three hundred and thirteen days. There are three hundred and thirteen working days in the year, but practically all may not be used. If you qualify his statement by varying the price of the coal, or by varying the number of days, the qualification must be

received, and have its weight.

But there is a more important qualification than these, far away. Mr. Bacon says that he considers the average consumption of coal in the manufacturing establishments of Massachusetts to be fully four pounds per horse-power for each hour. I should venture to say, if you take the engines in the manufacturing establishments in Massachusetts, from one end to the other, you will find that there are more engines that cost five pounds and a half of coal per horsepower, than there are that run with three pounds; and good engines, too. Dr. Hayes, in his laboratory, can undoubtedly produce his horse-power with less than three pounds; but it is not Dr. Hayes that runs the engines, and it is not Dr. Hayes who sees that the engines are always in the absolutely fine condition for running, nor does he select the coal; and we are to calculate this work as it is ordinarily done, by ordinary agents, and with ordinary tools and materials. My impression is, that we should any of us be very glad to contract that our engines should produce a horse-power with four pounds of coal per hour.

Estimated in that way, the result is very different. If I am right in supposing that we should cast this at 313 days, and should estimate it at four pounds of coal per horse-power per hour, and should call the coal worth \$8.00 a ton, we should then find that the cost of running an engine of 325 horse-power would be very different from the cost stated by Mr. Mills. As I have made it, the coal, at 2,000 pounds to the ton, would equal 6.26 tons a horse-power, instead of 9,000 pounds. Instead of four tons and a half, it would equal six tons and a quarter. And that, at \$8.00 a ton, is equal to fifty dollars per annum per horse-power for coal alone; which would make the running of an engine of 325 horse-power cost \$16,250, instead of the sum stated by Mr.

Bacon.

Now, it is not for me to cavil over one sum or another before you. We ask you to put upon the shaft we have the power the city has taken away from us, or to give us the means of putting it on. We ask you to apply to it simply and exactly the considerations that you would apply to any other question; the rules of right, and the rules of calculation, that would be applied in any other case. We believe that \$25,000 a year would not supply us with the power the city has taken away from us. It may be less. Whatever it is, give it to us. Give it to us in the form of capital, as it must be. I may here say what is known to you already, but I would make sure that it enters into your calculation;

we are running all the risk of the continuance of the price you fix for coal. You fix one or another or another price, and we take all the risk of it. Look back ten years and observe the change that has come upon the price of coal in England, where the exigencies of war had not arisen to disturb the common course of events, but where the nation woke up to discover that the coal-beds were being fast exhausted. Now, gentlemen, there are in this country only four hundred square miles of anthracite coal, leaving out the little thread in Rhode Island. Against that you may put an innumerable number of miles of bituminous coal; but anthracite coal is the coal we are dealing with. It lies in the little basin of the seventeen townships in Pennsylvania. It is every year being exhausted in geometrical proportion. Think of it! we have been using it only about forty years; for common purposes, not thirty; and, already, the first and second veins are exhausted. Now, gentlemen, we are forced to take this risk by the act of the City of Boston. Will you see to it that our rights are not infringed in view of that? Shall we be compelled to look into the future, and foresee and brave all the consequences of those changes that come upon this as upon every other condition of human business, and the city, the spoiler, take no risk and pay no corresponding compensation? We ask you, gentlemen, to deal with these matters agreeably to their magnitude, remembering that all the light in our power is now thrown upon the subject, all the aid in our hands we have given you, - and whatever light or information the city holds in its hands that could illustrate and explain this matter has by those hands been put under a bushel, — and give just what you consider this power to be fairly worth to us.

One other thing, and I am done. We have our engine, boiler, etc., worth about what Mr. Bacon says they are. We understand, from the course of argument on the part of the city, that we are not to have any compensation for an engine. We have got one. The city takes away our water, renders useless the dain, the wheels, and all the appliances for using the water, and then says to us, "You have got an engine; you may use that; we are perfectly contented you should use that, and we will pay you for the power. No, gentlemen, no. The man who takes my horse cannot say to me, "You have got another that is just as good; you can use that; I am not going to pay for the one I have taken."

We are entitled that the city should, from foundation-stone to turret, give to us the means of producing the power that she has taken away from us. That, and that alone, will satisfy us. And it is not right for the city to insist, because

we have an engine, with its appliances for use in our mill, that it shall not supply us with another, or its cost. Why should we wear out our engine in producing the very thing she has taken away from us, — power, without compensation? We claim that we should receive at your hands the full value of all the steam, machinery, and appliances necessary to create the power that they have taken away.

With these elements in your hands, we shall leave it to you to prove the estimate of what is right and fair for us to receive. And with very sincere thanks, gentlemen, for your kindness in listening so patiently to an uninteresting exposition of my clients' claims, and the proofs and arguments in their support, I leave in your hands our cause and await

your judgment.

Mr. BUTLER. I want to put in two matters. I want to put in the rainfall of Lake Cochituate by months, during the years 1872, '3, '4, and '5. We could carry it back to 1852, but it is only for the purpose of comparison with my friend's table. I also put in the 58th page of City Document No. 78. [See Appendix, "E" and "F."]

Mr. Hodges. Put them in. I only say that there is, in one or two of those tables, a very extraordinary error. Had you put the witness upon the stand, I should have called his attention to it; but for the purposes for which these are

put in I will not make any objection.

Mr. Butler. I desire to call your attention to two matters. You will find by the City Document from which my brother read, that the water was taken away from Farm pond in 1875, from the 1st of January to the 18th of March,—that makes 54 days; and then from March 26 to April 4,—9 days; April 6 to 14,—8 days; May 3 to 10,—7 days; June 3 to 10,—7 days. That I call the wet season. Then from October 2 to 11,—9 days. That makes 94 days during the wet season. The total number of days was 143, leaving 49 days of the dry season. So that they could only have been deprived of water in the dry season; and that renders those tables, in my judgment, wholly innocuous.

There is another element omitted in that calculation, and that is, he has left out the fact that there was so much power that had to be used in turning the fly-wheel and connections, before it became available for the machinery. But, no mat-

ter. It is of no consequence.

Mr. Hodges. It is of consequence. I thank the gentleman for teaching me that word. The witness says that his experience teaches him, — and it is his business to know such matters, — that there is always in every mill of a mixed character, stoppages enough of this loom, that spinner, and

that picker, to equal the amount that it requires to pass the

power from the engine to the operating machines.

A comparison of the monthly fall of water introduced, I believe, by the gentleman now, will justify to a dot the figures I have presented to you in the calculations I have made concerning the result from 1871 to 1875.

[Adjourned to Monday, October 2, at $11\frac{1}{4}$ o'clock.]

Sheet 1.

[A.] Record of Power Used at Saxonville Mills, 1871 to 1875.

STEAM.								MILLS RUN BY WATER BEGINNING JUNE 17, 1871.	
Months.	1871.	1872.	1873.	1874.	1875.		MILLS.	1871.	
Jan Feb March April	••	4 9½ 8	••	1 	$ \begin{array}{c c} 22 \\ 20\frac{1}{2} \\ 8\frac{1}{2} \\ & \ddots \\ \end{array} $	ll No. 1. Horse-power.	No. 1 No. 2 Both	40½ 78½ 26	
May June July	19	$ \begin{array}{c} 1\frac{1}{2} \\ 10\frac{1}{2} \\ 26 \end{array} $	$ \begin{array}{c c} 5\frac{1}{2} \\ 21 \\ 26 \end{array} $	4 25	10 26	No. 1. Iorse-p	MILLS.	1872.	
Aug Sept Oct Nov	22 27 10½ 3 9½	164 7 	17½ 25 12 3 134	17 24 27 24 26	26 26 11 3½ 4	Mill 239.457 H	No. 1 No. 2 Both	. 192 175½ 125	
Total	$\frac{35}{115\frac{1}{2}}$	843	1113	$\frac{20}{147\frac{1}{2}}$.	$\frac{4}{157\frac{1}{2}}$		MILLS.	1873.	
	No. 1 No. 2 Both	196 210 164							
Jan Feb March	••	$ \begin{array}{c} 8\frac{1}{2} \\ 10\frac{1}{4} \\ 16 \\ 17\frac{1}{2} \\ 5\frac{1}{2} \\ 7\frac{1}{2} \\ 26 \\ 20 \end{array} $	2 54 12 34 154 22 15	16½ 16½ 15	22 17 3½ 3 10 18 17	ill No. 2. Horse-power.	MILLS.	1874.	
April May June July Aug	 19 22						No. 1 No. 2 Both	159½ 184 154	
Sept Oct	27 10½	$6\frac{3}{4}$ $2\frac{1}{2}$ $\frac{3}{4}$	16 11	21½ 27	$\frac{13\frac{1}{2}}{10}$	Mill 3 86.154 Ho	MILLS.	1875.	
Nov Dec	$\begin{array}{c} 3\\9\frac{1}{2}\\\hline 91\end{array}$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		$\begin{array}{c c} 4 & \widetilde{\infty} \\ 17\frac{1}{2} \\ \hline 135\frac{1}{2} \end{array}$		No. 1 No. 2 Both	132 152 1 89		
			1)					

Sheet 2.

[B.]

Aggregate of Power Used at Saxonville Mills, 1870 to 1875.

No. 1.

It requires 325.6 horse-power to carry the machinery, viz.: 239.5 for Mill No. 1 and 86.1 for Mill No. 2 \times 313, the working days of the year = 101,913 horse-power used in the year.

No. 2.—	970									
WATER.—Both mills run 125 days \times 325.6 = hors Mill No. 1 " 67 " \times 239.5 =	e-power for one day 40,700 }									
Mill No. 2 " $50\frac{1}{2}$ " \times 86.1 =	" " $4,343$) = 61,089.5									
DIBAM: — MIII 110: 1 014 \ \ 200:0 —	" " 20,297.5 Steam. " 11,932.5 = 32,230									
MIII NO. 2 1304 X 00 =	11,552.0) = 52,200									
Refer to No. 2, Sheet 3, for correction. 93,319.5										
No. 3.—	873.									
WATER.—Both mills run 164 days × 325.6 = horse	nower for one day 53 308 4)									
Mill No. 1 " 32 " × 239.5 =	" " " 7,654 Water.									
Milli 140. 2 ±0 × 50.1 —	" " 3,960) = 65,012.4									
SIEAM. — MIII NO. I III _A	" " 2,6764 Steam. " " 8,500 = 35,264									
7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7										
	100,276.4									
No. 4.—1	874.									
WATER.—Both mills run 154 days × 325.6 = hors										
Mill 10. 1 52 \ 255.5 -	" " " 1,317 Water. " " 2,583 = 54,032.4									
STEAM Mill No. 1 " - " × 239.5 =	" " 35,326) Steam.									
Mill No. 2 " - " × 86.1=	" " 9,686 } = 45,012									
	99,044.4									
No. 5.—1	.875.									
WATERBoth mills run 89 days × 325.6 = horse	e-power for one day 28,969.5)									
A 200.0 —	" " 10,298.5 Water. " " 5,488.8 = 44,756.8									
3111 140. 2 00 ₄ \ 00.1 -	" " 5,488.8 = 44,150.8									
	" " $11,666.5$ = 49,387.5									
Refer to No. 3, Sheet	3. for correction. 94,194.3									
TOTAL TO THE OF EMECE	,									
No. 6 –1	071									

No. 6.—1871.

For this year repeat the figures of 1873, the rainfall being the same, viz. \ \ \text{Water, 65,012.4} \ \text{Item 1, Sheet 3.} \ \ \ \text{Steam, 35,264.} \]

100,276.4

Sheet 3.

[C.]

Corrections of Record of Power for 1871 to 1875.

No. 1.

For 1871 the record begins in June, and is consequently imperfect, and I substitute a duplicate of the record of 1873 in its place, the rainfall being substantially the same.

No. 2.

In 1872 the city took 1,676,666,400 gallons in 75 days, between June and September. This was so much power taken from the water credit and supplied by and credited to the steam. It is equal to 7,614 horse-power one day, viz: $1,676,666,400 \div 75 = 22,355,552 \times 8\frac{1}{3} = 186,296,266 \div 1440 = 129,372 \times 26 = 3,363,672 \div 33,000 = 102 \times 75 = 7,650$, which should be deducted from the sum of the steam-power employed this year, and added to the water-power.

No. 3.

In 1875 the city took in 143 days, between January 21 and October 11, 2,555,800,000 gallons, equal to 11,440 horse-power for one day. It will be ascertained by the rule applied in No. 2. This sum should be deducted from the steam and added to the water service of that year.

No. 4.

	Water.	Steam.		Total.
1871	65,016 As per item No. 1 sup.	35,264	=	100,280
1872	68,739 As per item No. 2 sup.	24,580	=	93,319
1873	65,016	35,264	=	100,280
1874	54,032	45,012	=	99,044
1875	56,196.8 As per item No 3.	37,947.5		94,144.3
	308,999.8	178,052.5		487,067.3

Aggregate from Sheet 2, with corrections, showing amount of water and steam power used in 5 years, from 1871 to 1875, inclusive; rainfall being 44.14.

Sheet 4.

[D.]

Comparison of Rainfall Power in periods of 5 Years each prior to 1871.

No. 1.

1856 to 1860, rainfall 51 inches. Suppose the power used at Saxonville to be the same for those five years as for the five years from 1871 to 1875, and suppose the rainfall to afford power in proportion to its amount, and the comparison may be stated thus: 44.14:308,999.8::51:357,022.9, sum of water-power used these five years.

The result would be stated more fully thus: Whole amount of power 487,067.3; of which 357,022.9 is water, and 130,044.4 steam,

No. 2.

1861 to 1865, rainfall 51.49. Assuming as in No. 1, and the figures will be thus: 4,414: 308,999.8:: 515: 360,523, sum of water-power used these five years. Stated fully it is, whole power 487,067.3, of which 360,523 is water and 126,544 steam.

No. 3.

1866 to 1870, rainfall 57.77. Assuming as above in Nos. 1 and, 2 and the figures will be 44.14:308,999.8::5,777:403,937, sum of water-power used these five years.

Stated, it is, whole power 487,067.3, of which 4,039.37 is water and 83,130.3 is steam.

Average comparison of the powers used in these 4 semi-decades: —

Steam

Water.

	***************************************	C COUILI.		
1856 to 1860 1861 to 1865 1866 to 1870 1871 to 1875	360,523 403,937	$ \begin{array}{c} 130,044.4 \\ 126,544 \\ 83,130.3 \\ 178,052.5 \end{array} $	487,067.3	
	1,430,482,7	518.771.2	1.949.253.9. Water, 11.15. Steam, 4.15.	

Problem.

Suppose the mills to be run at say No. 1 at 240 horse-power 9 months by day and 8 months by night. The result may be stated thus: 9+8=17 months, or 517 days \times 240 = 124,080 horse-power for one day-

Problem.

Suppose No. 2 (85 horse-power) to be run 12 months by day and 7 by night, it would produce this result: 12+7=19 months = 569 days \times 85 = 48,065 horse-power for one day.

Problem.

Combine the foregoing, and we have: $124,080+48,065=172,145\div313=550$ horse-power per day for every year.

 $egin{array}{c} [{f E}_{m{ar{\circ}}}] \ Rainfall\ at\ Lake\ Cochituate. \end{array}$

	1872.	1873.	1874.	1875.	
	Inches.	Inches.	Inches.	Inches.	
January	1.86	4.24	2.96	2.42	
February	1.37	2.43	2.90	3.15	
March	3.06	3.98	1.18	3.74	
April	1.74	2.69	6,36	3.23	
May	3.24	3.24	3.40	3.56	
June	4.27	0.38	4.79	6.24	
July	5.55	4.08	3.16	3.57	
August	9.76	7.17	4.83	5.53	
September	6.29	2.62	1.55	3,43	
October	3,69	6.11	1.04	4.85	
November	4.22	4.54	2.05	4.83	
December	3.42	3.95	1.70	0.94	
Totals	48.47	45.43	35.93	45.49	

[F.]

LAKE COCHITUATE.

Table showing the monthly and annual rainfall at Lake Cochituate from 1852 to 1871 inclusive; also the average for each month for the whole term.

			1	1		1					1	1	
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1852	5.80	1.76	4.42	9.60	2.60	2.00	2.16	8.27	2.04	3.40	2.76	3.12	47.93
1853	3.68	6.56	2.92	3.80	6.32	0.56	2.84	7.20	5.44	4.56	5.26	6.59	55.73
1854	2.45	5.16	4.16	5.60	3.92	3.98	2.32	0.28	3.68	3.37	7.79	2.34	43.15
1855	4.52	3.50	1.91	2.65	0.82	1.98	3.86	0.77	0.75	4.16	4.84	5.20	34.96
1856	1.44	0.22	0.66	4.27	7.81	1.77	1.76	11.40	3.13	2.34	1.43	4.57	40.80
1857	2.51	1.30	1.72	10.23	7.15	4.02	8.85	6.62	4.27	7.06	3.07	6.30	63.10
1858	2.61	3.32	3.87	4.39	2,23	10.17	3.46	6.42	5.17	2.12	2.91	1.99	48.66
1859	5.64	2.91	10.95	1.37	3.46	3,16	0.99	7.69	4.56	0.33	3.55	4.41	49.02
1860	1.24	3.80	1.98	2.25	1.98	11.16	6.82	4.89	9.92	1.72	5.97	3.71	55.44
1861	2.51	3.81	2.75	6.44	3.12	2.64	1.62	7.79	2.76	3.20	6.20	2.60	45.44
1862	7.82	1.08	4.18	1.85	2.71	6.58	6.54	1.43	2.62	4.83	7.69	2.36	49.69
1863	4.10	4.38	3.57	11.34	2 66	1.98	14.12	5.61	3.39	4.56	8.54	5.05	69.3 0
1864	3.37	0.98	8.44	4.02	2.84	0.58	1.06	3.56	1.52	6.50	5.45	4.28	42.60
1865	4.99	4.45	5.48	2.18	8.25	0.91	3.10	3,36	1.66	6.99	4.78	3.31	49.46
1866	1.44	5.80	3.92	1.94	6.46	4.80	13.35	3.98	8.36	3.43	4.52	4.32	62.32
1867	2.76	5.40	5.65	2.43	6.46	2.95	5.36	12.36	1.08	7.27	2.63	1.90	56.25
1868	3.70	1.18	2.51	5.61	8.12	2.95	2.16	7.38	7.69	1.19	6.77	0.45	49.71
1869	3.71	7.07	7.52	2.57	7.59	3,68	2.63	2.34	8.49	9.50	3,26	5.98	64.34
1870	7.85	4.68	6.04	8.81	3.14	4.05	3.10	2.03	0.64	7.96	4.40	3.19	55.89
1871	1.31	2.30	5.02	2.29	5.66	5.96	2.20	3.56	1.46	5.38	7.01	3.24	45.39
Av.	3.67	3.48	4.38	4.68	4.67	3.70	4.42	5.35	3.93	4.49	4.94	3.75	51.46

Monday, October 2d, 1876.

The commissioners met, pursuant to adjournment, at 1114

o'clock, A. M.

Commissioner Russell. There is one point to which the commissioners would like to call the attention both of the counsel in the cases that have been heard, and of the counsel in the cases that are to be heard. We understand that the counsel for the city claim that under their construction of the second section of the Act of 1872, the city is not authorized to draw water from Sudbury river, at any time when water is running over the dam at Lake Cochituate.

Mr. Butler. Yes, sir.

Commissioner Russell. And that that restriction is absolute, and applies to any method in which the city may draw water from the Sudbury river.

Mr. Butler. I think so. Of course, it is of no consequence how they get it out. They are not authorized to

draw it.

Commissioner Russell. The construction of that section might be otherwise; and the commissioners would like to suggest that to the counsel, that they may be heard upon it.

Mr. Abbott. I did not mean to acquiesce in that, because I think it is otherwise; and at the proper time I shall take

occasion to so claim.

Mr. Merwin. That is a point that was not taken or suggested in the case of the Essex Company, which I represent. I think there is an obvious answer to it; and, if now is a proper time, I shall be quite ready to submit what I have to say upon it.

Commissioner Russell. Perhaps, to avoid opening the case of the Essex Company again, you may be content to have those views submitted by the counsel in the cases that

are to follow.

Mr. Abbott. You may as well present them now, Mr. Merwin.

Mr. Butler. I see that it is capable of two constructions; but I have a view upon it, which I think will show what was intended.

Commissioner Russell. The construction was first stated at the hearing of the case for the Saxonville mills, and, I think, was first suggested in the closing argument for the city; and I thought there should be an opportunity for a discussion of that question.

Mr. Butler. My proposition is, simply, that so far as we have taken the water, up to the time of the filing of the petitions, we have taken it but in one way, and, taking it in that way, we are limited to certain restrictions, and nobody has a right to presume that we have an intention to do it in any other way, or that we should do it differently from what the statute requires.

Commissioner Russell. Mr. Merwin, I think you should

be heard upon that point.

Mr. Merwin. In the first place, gentlemen, by the first section of the act under consideration, the City of Boston are authorized to take all the water of Sudbury river. That is the first and comprehensive provision which is made on that subject with the qualification contained in Section 4, to which I will refer; and that qualification is, "That nothing contained in this act shall be so construed as to authorize the City of Boston to reduce the water in Sudbury river below a sufficient height," etc., — that is not pertinent to this inquiry, — "or to draw from Farm pond or Sudbury river into Lake Cochituate when the water runs over the dam at Lake Cochituate."

Now, as furnishing an entire answer, as I apprehend, to the suggestion on the other side, we have this authority, found in sections 1st, 2d, and 3d of this act: In the first place, a provision that the City of Boston may take all the water of Sudbury river for the purposes designated in this act. They may not only do that, but they may build, among other things, all such reservoirs as may be necessary for storing all the water of Sudbury river. That is contained in the first section. It is repeated in the second section, "For the purposes of this act the said city may make and build one, or more, permanent aqueducts from the aforesaid water-sources to Chestnut Hill reservoir."

And that leads me to say, in the second place, that by the terms of this act the City of Boston are not called upon or required to draw one drop of the water of Sudbury river into the Cochituate pond. They may divert the whole of it, at their discretion, into the Chestnut Hill reservoir, or into any other reservoir, which they may build for the purpose of retaining and storing this water of Sudbury river until they have occasion to use it.

"For the purposes of this act the said city may make and build one, or more, permanent aqueducts from the aforesaid water-sources to Chestnut Hill reservoir, or to any other reservoir owned by said city, and maintain the same by any work suitable therefor." That is one thing they may do. "May connect the said water-sources with Lake Cochituate;" but the authority and discretion not to connect the waters of this river with Lake Cochituate is quite as apparent, quite as distinct, and quite as prominent as the authority to divert it into Lake Cochituate,—because the first authority given is to connect by suitable aqueducts the water of this river with Chestnut Hill reservoir or any other reservoir that may be constructed by the city for that purpose. And so, following it through, you will see in Section 3d provisions for building these reservoirs for the purpose of holding this

water, at the discretion of the city.

So that I submit, may it please the commissioners, that, in the first place, the City of Boston is authorized to erect and maintain reservoirs for the purpose of the storing of that water, and is not required to turn one drop of it into the Cochituate pond, or into Farm pond; and whether they do so or not is at the election and discretion of the city; whether they do it in whole or in part is at the election of the city. And, therefore, we must apply to this provision the rule which has been uniformly adopted in these cases; and that is, we must assume that whatever the City of Boston may do it will do. If it is authorized to take all the water of the Sudbury river, and store it in reservoirs and not divert a drop of it into the Cochituate pond, for the purposes of this case, you must assume that they will do so. Otherwise you will fall far short of doing justice to these petitioners; because if you should predicate your judgment in these cases upon the assumption that a part of this water might be turned into Cochituate pond, and flow over the dam of Cochituate pond, and thus flow in its natural channel to any of these mills, why, the City of Boston might do just what this act contemplates that they will do; and that is, build sufficient reservoirs to hold this water, so that not any of it should go into Cochituate lake or into Farm pond.

A stronger, or more pertinent illustration, it seems to me, cannot be found, in a case of this sort, than is found in Ipswich Mills vs. the County of Essex. There the City of Salem were authorized to take the waters of a certain pond for the purposes of the city, and the same act included this provision, — that any of the towns through which the pipes were laid from this main pond to the City of Salem might have the right, upon paying a reasonable compensation to the City of Salem, to take a sufficient quantity of water for their purposes. The town of Beverly for a year and a half or two years did not exercise that right. The petitioner suffered no damage so long as this water was used only in

the manner originally contemplated by the act, by the City of Salem. But when the town of Beverly tapped this pipe, and took the water for its purposes, his mill was substantially and very seriously injured. But the Court held in that case that, inasmuch as the petitioner had waited beyond the time prescribed in the statute for assessment of his damages, although the act which really caused him the injury had been done within a very short time of the filing of the petition, his right was gone, because the original taking by the City of Salem was a taking within the purview of the act. They had taken it, within the contemplation of the law, for all the purposes for which it could be lawfully taken within the terms of the act, and, among others, for the purpose of furnishing all those adjacent towns with water. And therefore the petition was dismissed without any assessment of damages, although in that case the act of taking which really resulted in the injury was one or two years subsequent to the actual taking by the City of Salem, for the appropriate purposes of that city.

Now, the City of Boston to-day may take this water in a certain way, which may not result to-day in serious injury to any of the mill-owners on the stream, below the Sudbury; and to-morrow, or the next day, or the next year they may do all that the act authorizes them to do, and, if they do it, the answer, unless you assess the damages now, would be, as in that case, "You come into court too late." This taking was made at the time the city originally took the water for any and for all the purposes for which they were authorized to

take it by the terms of the act.

I therefore submit, Mr. Chairman and gentlemen, that that suggestion has no force whatever; and in behalf of the Essex Company (if I may make the suggestion without weakening the legal answer,—I mean the answer so far as the construction of this statute is concerned,)—I would farther say that, even if the position taken by the learned counsel is in any degree correct, it will furnish no reason for diminishing the assessment of damages in their behalf, because the value of their mill-property will not be increased an iota by the construction contended for, that in times of freshet the City of Boston must allow the Sudbury river to flow down its natural channel. Mills are not built with reference to the quantity of water in the stream at times of freshet, but in reference to the quantity of water in the lowest periods of the year.

Mr. Butler. Pardon me, I think this is not arguing the

question.

Commissioner Russell. This is hardly arguing the construction of the statute.

Mr. Merwin. If that construction is adopted, still it ought not to diminish our damages. It ought not to affect

the amount of damages that we are to recover.

Mr. Butler. I only desire that whenever the commissioners make a report (I do not propose to argue the question at all), they may make the report as to the grounds on which they took it; that they had a right to take it all in another way; and that that proposition is wholly a nugatory one, and does not mean anything; — that, being put in carefully at the last end, it was only put in there for amusement. I do not propose to argue it at all. The commissioners may put it as they see fit. I would say, however, in reply to the criticism upon the Ipswich case, that if the town had put in a thirty-inch aqueduct into Wenham pond, which could carry only so much water, then, in order to supply Beverly, they would put in another thirty-inch aqueduct. I think the court would have said that that was a new taking.

Mr. Abbott. That is the very thing they did do. Mr. Butler. They took from their original pipe.
Mr. Abbott. They put in a larger aqueduct.
Mr. Butler. It is the first time that I ever heard that

prescriptive words of a statute were nugatory.

Commissioner Russell. Gentlemen, will vou proceed with the case of "Talbot et al. vs. the City of Boston." I think these two cases can be heard just as well together. Mr. Butler claims that they ought to have been joined to-

gether.

Mr. Butler. I propose to object to the fact that they are brought separately and not jointly, so that the commissioners are obliged to make a separate assessment on each, while the commissioners, being one and the same body, can do that without trouble and difficulty, and would probably find out what the whole value of the water taken was, and then divide it equitably among the parties. When the case goes to a jury, if ever, there would be this great and practical difficulty: first, that one jury might find the water to be a very large amount in one case (or a very small amount), and the damages a very small amount or a very large amount, going to one proprietor of the water; and in the other case another jury might find an entirely different amount, either larger or smaller than the first jury, and thus the city might be in a condition of paying a great deal more than the rightful damages of either one of the petitioners, provided they had joined together in one petition; and the city is put to the expense and trouble of dividing between the petitioners themselves the amount of their rights and the amount of damages which should go to each, by the testimony and argument during the trial, instead of the damage done by the taking being assessed, and then allowing the parties to make the division among themselves, in such manner as they are advised. That is, while this matter is a practical one, and one of very considerable difficulty, the commissioners have no power to try the cases together. I do not see how the Court can put them together.

Mr. Abbott. My proposition was this: that the evidence should be heard in both cases together, to save the trouble

of going over the cases twice.

Mr. Butler. Practically, there will be no difficulty,—because all the testimony to one case, applicable to the other, will be in. I prefer to treat them separately, for the reason that they ought to have been together,—if that is not a paradox.

Commissioner Russell. I suppose, then, they must be

separately heard.

Mr. Butler. *Here*, there will be no bad result. In the other case, there might be.

CHARLES P. TALBOT, ET AL., PETITIONER, FOR ASSESSMENT OF DAMAGES, vs. CITY OF BOSTON.

To the Honorable the Justices of the Superior Court, now sitting at Cambridge, within and for the County of Middlesex and Commonwealth of Massachusetts:—

The petition of Charles P. Talbot and Thomas Talbot, respec-

tively of Lowell and Billerica, in said county,

Respectfullly represent your petitioners that they are now, and for three years last past and longer have been, the owners in fee simple and possessed of certain parcels of land, with the buildings thereon standing, situate in Billerica aforesaid, and bounded and described as follows:—

FIRST PARCEL.

Beginning at the southeast corner of the bridge over the canal at the abutment, and running a southerly course one hundred and seventy-two feet, more or less, to land now or late of Joel Dix; thence southerly, a little more easterly, by said Dix land, one hundred and sixty-two feet, more or less, to a stake; thence the line turns nearly at a right angle and runs an easterly course, by the stone wall, eighty-seven feet, more or less, to the Concord river; thence a northerly course by the river thirty feet, more or less, to a stake; thence the line turns and runs a northeasterly course by the river one hundred and nineteen feet, more or less, to

a bend in the river; thence the line runs a northerly course one hundred and twenty-one feet, more or less, by the river to the northeast corner of a wooden store-house or building; thence northerly by the river on a curving line to the northerly side of the towing-path, or floating bridge, one hundred feet, more or less; thence by a westerly course one hundred and thirty-eight feet, more or less, to the point of beginning; containing about forty-eight thousand square feet.

SECOND PARCEL.

Beginning at the same place as the last-described piece, at the southeast corner of the canal bridge, from thence the line runs on the southerly side of the canal, an easterly course, one hundred and thirty feet, more or less; thence north-northwesterly across the canal seventy feet, more or less, to the most easterly point in the wharf by the Concord river; thence the line runs a north-westerly course, by said river and wharf, eighty-eight feet, more or less, to a point that is one hundred and thirty feet from the point of beginning; thence southerly by the roadway one hundred and thirty feet to the point of beginning; containing ninety-six hundred square feet, more or less.

THIRD PARCEL.

Beginning at the southwest corner of the bridge over Concord river, near the Milldam, thence westerly by the river one hnndred and eighty feet, more or less; thence in a curving line by the river thirty-four feet, more or less; thence southerly by said river to the southwesterly corner of the saw-mill, or the stone wall, one hundred and twenty-five feet, more or less; thence nearly at a right angle by a stone wall and Concord river one hundred and seventy-two feet, more or less, to the northeast corner of the dye-house and canal wasteway; thence nearly at a right-angle westerly by said river and bank of the canal one hundred and ninety feet, more or less, to a stake and stones; thence nearly at a right angle southerly or south-southeasterly, crossing the canal, partly by land, now or late of Mixer, two hundred and sixteen feet, more or less, to the county road leading to the mills; thence nearly at a right angle easterly by said road two hundred and seventy feet, more or less, to a post driven in the ground at a curve in the road; thence northeasterly one hundred and five feet to a stake at the bridge over the canal; thence more northerly by the canal bridge and county road one hundred and twenty-eight feet to the southeasterly corner of the mill basin; thence northerly by said bridge and county road through the basin one hundred and forty-five feet to the point of beginning.

FOURTH PARCEL.

Beginning at the northeast corner of the land sold by the proprietors of Middlesex Canal to John Mixer; thence northerly,

crossing the canal, to ninety-two feet, more or less, to the Concord river; thence westerly by said river two hundred and ten feet, more or less; thence southerly, crossing the canal one hundred feet to the northwest corner of land sold by said proprietors to John Mixer; thence easterly two hundred and five feet by the southerly side of the towing path; containing eighteen thousand six hundred feet, more or less.

FIFTH PARCEL.

Beginning at the northwest corner of land, last described, by the Concord river; thence west-northwesterly by said river one hundred and fifty-two feet, more or less, passing by the guard gate; thence crossing the canal southerly one hundred and thirteen feet to the northwesterly corner of a piece of land sold by said propritors to Israel Colson; thence easterly or southeasterly by said Colson land to a stake at the northwesterly corner of land sold to John Mixer; thence northerly, crossing the canal, one hundred feet to the Concord river at the point of beginning; containing about thirteen thousand three hundred and seventy feet, more or less.

SIXTH PARCEL.

Beginning at the county road at the southwest corner of land sold by said proprietors to John M. Colson, partly by land last described, crossing the canal three hundred and fifty-three feet to Concord river; thence by Concord river, at the foot of the canal bank, two hundred and fifteen feet to a stake by the southerly side of said river; thence by the river one hundred and five feet to the northern end of the lock; thence west by the northeast end of said lock, seventeen feet to the west side of said lock; thence northeast by said river ninety feet, more or less; thence west one hundred and nineteen feet to the private way of one —— Farmer, deceased; thence south by said way to a point near the southeast end of Farmer's bridge, two hundred and fifty-two feet; thence southeasterly, by the road, eighty-six feet, more or less, to another private road: thence south by said last private roadway five hundred and eightyseven feet; containing one hundred and eighteen thousand three hundred and sixty-three feet.

SEVENTH PARCEL.

Beginning at a point in the county road leading to the mills, just fifty-one feet westerly of the southwesterly corner of the land the proprietors of the Middlesex Canal sold to Israel Colson; and from thence the line runs a westerly course by the said county road three hundred and sixty-two feet, more or less, to a stake and stones northeasterly from said Israel Colson's house; from thence the line curves and runs ninety feet, more or less, to a stake and stones on the road leading to the canal; from thence the line runs a northerly course three hundred and forty-five feet, more or less, to the private way laid out by said proprietors; thence by said private way five hundred and twenty-three feet, more or less, to

the county road at the point of beginning; containing about eighty-four thousand one hundred thirteen feet, more or less.

EIGHTH PARCEL.

Beginning at the southwesterly corner of land sold by said proprietors to Israel Colson, northwesterly by the said private way laid out by the said proprietors, five hundred and eighty-seven feet, more or less, to the road leading by Colson's house to the canal; thence southerly fifty-one feet by said last-named road; thence southeasterly five hundred and twenty-three feet, more or less, to the county road leading to the mills; thence fifty-one feet, more or less, to the point of beginning; containing twenty-two thousand two hundred feet, more or less.

NINTH PARCEL.

Beginning at the road near William Rogers' house, thence easterly by said road; northerly by land of said proprietors; westerly by the Mill pond, so called; southerly by land formerly of Jonathan Pollard, an elm tree standing in the line, to the first-mentioned bound, containing an acre, more or less.

TENTH PARCEL.

Beginning at the stake and stones opposite the westerly end of William Rogers' dwelling-house on the westerly side of the road that leads from Billerica meeting-house, just five rods distant from the wall on the north side of the bank of the canal as now stoned up; thence northwesterly by said Rogers' land, keeping just five rods distant from the said wall on the north side of the bank of the canal, continuing or extending into the Mill pond or Concord river; thence keeping five rods distant from the canal agreeably to the course thereof, as far westward as said Rogers' land extended, and as far as he had a right to sell to said proprietors; thence westerly by Concord river until it comes to Jonathan Pollard's land, or land which he sold said proprietors; thence eastwardly by the land so sold and to the road; thence northerly by the said road to the bound at the point of beginning; containing about an acre and a quarter.

ELEVENTH PARCEL.

Beginning at a stake and stones by the easterly side of the road just four rods distant from the southeasterly corner of said Rogers' dwelling-house; thence easterly by said Rogers' land about seventeen rods to a stake and stones placed just ten and a half rods from the centre line of the Middlesex Canal, measuring at right angles from said centre line; thence more southeasterly, parallel with said centre line, and just ten and one-half rods from it, along the southerly line of said Rogers' land to the Jonas Saunders road, so called; southerly along said road, across the canal at the

bridge, and extending southward to a stake and stones just ten rods from the centre line of said canal, measuring at right angles, thence northwesterly at a distance of ten rods from said centre line to a stake and stones at the first-mentioned road; thence north-northeasterly by the east side of said road crossing the canal at the bound first mentioned.

TWELFTH PARCEL.

Beginning at the northerly side of the road leading from Billerica to Billerica mills, at a point three hundred and seventy-five feet distant easterly from the canal bridge, as said road runs; thence northerly two hundred and sixteen feet; thence westerly two hundred and five feet; thence southeasterly, running at right angles to it, to said road; thence by said road to the point of beginning.

THIRTEENTH PARCEL.

Beginning at a point in said last-named road leading from Billerica to Billerica mills, at the southwesterly corner of the last-described parcel; thence running at right angles to said road about two hundred and eight feet along said last-described parcel; thence west-northwesterly one hundred and forty-eight feet; thence turning and running three hundred and fifty-three feet south-south-easterly to said road and at right angles to the same; thence along said road to the point of beginning.

FOURTEENTH PARCEL.

All that tract of land lying to the northeast of parcels nine, ten and eleven, and southwest of the location of the Boston, Lowell and Nashua Railroad.

FIFTEENTH PARCEL.

All that tract of land lying between Wilson street, so called, and Concord river, bounded as follows: Beginning at a point on the southeasterly side of Wilson street, distant thirty-eight and three-quarters rods, as the line runs, southwesterly from Elm street, which is the road first described, as leading from Billerica to the mill, thence southwesterly on said road as the line runs twenty-five rods; thence nearly at a right angle on these lines to the river fifteen and five-eighths rods; thence northeasterly on a curving line by the river about thirty-one rods; thence northeasterly, nearly at a right angle on three lines, about twenty-five rods, to said Wilson street at the point of beginning.

SIXTEENTH PARCEL.

Beginning at a point on the northwesterly side of Wilson street, at a point distant eighteen and three-quarters rods; southwesterly from Elm street, and running southwesterly on two lines fifty rods along said road; thence northwesterly, ten rods; thence north-

easterly, forty-seven and one-half rods; thence, at a right angle, ten rods southeasterly to said Wilson street, at the point of beginning.

SEVENTEENTH PARCEL.

Beginning on Wilson street, at the northeasterly corner of the last-described parcel, thence northeasterly on said street five and one-half roads; thence northwesterly, ten rods; thence southwesterly, four and one-half rods; thence southeasterly, eight rods and one-half to said Wilson street, at the point of beginning,—be said measurements more or less.

EIGHTEENTH PARCEL.

Beginning at the northwesterly corner of the last-described parcel; thence southwesterly along the same, one rod; thence northwesterly to Elm street, so called, and at right angles to it, seven and one-half rods; thence northeasterly along said Elm street, five rods; thence at right angles to said street, ten rods to the northeast boundary of the last-described parcel; thence northwesterly along said boundary, five rods to the point of beginning.

And your petitioners further say that they are the owners and proprietors of certain valuable water-rights, water and mill privileges arising from, and formed by, the said Concord river at the mill-dam described and referred to, and of the right to use the waters of said river for all legal purposes at their property herein described in said Billerica, and that they have been such owners and proprietors of said valuable water-rights, water and mill privileges, and right to use the water of said Concord river for three

years last passed, and longer.

And your petitioners further say, that during all said period of three years last passed, and longer, they have been, and are now, the owners of certain water-mills, factories, and chemical works connected therewith, and used in the carrying on of their business upon said parcels of land in the manufacture of woollen goods and other fabrics, and in the preparation and working of logwood, chemicals, and dyes, run and operated by water-power derived and obtained by them from the waters flowing in and along the channel and bed of said Concord river, and from canals, artificial streams, and sluiceways from said Concord river, through and along the lands of your petitioners aforesaid.

And your petitioners further say, that they have the right, and for more than three years last past have had the right, that said Concord river should flow in the same manner and in the same quantity, volume, and force, and within the same limits, channel, and bed, as said river did at the time of the action of the City of Boston hereinafter set forth, and had from time immemorial prior thereto, and that the waters thereof should continue to flow by and through their lands, mills, and factories, in its ancient and accustomed natural channel and bed, and over your petitioners' dam,

and through the artificial streams and sluiceways in their land and

over and through their water-wheel.

And your petitioners further say, that Sudbury river, so called, in said Commonwealth, is one of the natural sources and tributaries of said Concord river and the waters thereof one, and the principal means of supply of said Concord river, and that the waters of said Sudbury river, when undisturbed and unobstructed and left to their natural course, and current, flow into the said Concord river above the lands, mills and factories of your petitioners before described, and through and by means of the said Concord river, naturally flow and pass by and through the lands, mills, and factories of your petitioners, and furnish power for running and operating the same, and are of great value to and advantage to your

petitioners.

And your petitioners further represent that by virtue of an act of the Legislature of the Commonwealth of Massachusetts, entitled "An act to authorize the City of Boston to obtain an additional supply of pure water," and approved the eighth day of April, A. D. 1872, and numbered one hundred and seventy-seven of the acts of said year, the said City of Boston, in said County of Suffolk, has within three years last past, previous to the date of the petition first actually taken, through the agency pointed out in said act and for the purposes therein set forth, all the waters of the Sudbury river, and all the water in Farm pond, so called, and of the streams and tributaries, whether natural or artificial, flowing into them and connecting them at and above the dam and permanent obstructions built by the said City of Boston in A. D. 1872, five hundred feet, more or less, below the crossing of said Sudbury river by the Boston, Clinton and Fitchburg Railroad, in the town of Framingham, in said County of Middlesex, and near and below the brook which is the outlet from Farm pond into said Sudbury river, and still continues and maintains the said taking, and said dam and permanent obstructions, and has withdrawn and diverted the said waters from their natural and accustomed flow into the said Concord river, and by and through the channel and bed thereof to and through the lands, mills and factories of your petitioners, and has altered and changed the natural course and current of said Sudbury river so that the waters thereof, and of Farm pond, no longer contribute or flow into the said Concord river, and have ceased through and by the channel and bed of said Concord river to reach, pass by and through the lands, mills and factories of your petitioner, and will not and can not flow through the channel and bed of said Concord river, and by and through the lands, mills, and factories of your petitioners aforesaid, as they, your petitioners, have the right they should, and as said waters would now and would hereafter continue to do, but for the action aforesaid of the said City of Boston.

And said petitioners further say that by means of said permanent obstruction of the natural flow, current, and course of the waters of the said Sudbury river and Farm pond, and the taking, withdrawal, and diverting thereof as aforesaid from their natural and accustomed flow, and by reason and means also of the said

permanent obstruction, dam, and erections, which the said City of Boston has built and erected as aforesaid, and still maintains, the waters of said Sudbury river and Farm pond do not and cannot now and will never hereafter flow, as they did and would naturally, into the said Concord river and through the channel and bed of the same, to and through the lands, mills, and factories of your petitioners, and the natural flow and stream of said Concord river through and by its channel and bed, and by and through the lands, mills, and factories of your petitioners, have been greatly lessened and reduced in quantity, volume, and force, and thereby and by reason thereof said petitioners are deprived of a large part of their water-power, water-rights, water and mill privileges, and of their right to the natural current and flow of said Concord river aforesaid, and that the same are permanently injured and destroyed, and that the same and their lands, mills, factories, and chemical works works are greatly damaged and lessened in value.

And your petitioners further say that by the said taking of the waters of the Sudbury river and Farm pond, and by the erection and maintenance of said dam, and by the acceptance of the powers and privileges given by said act by said city, and by their loss of the right to the natural flow of Concord river, they have sustained great damages in their property, and that they have not and have not been able to agree with the said City of Boston upon the damages to be paid them therefor, and that said city has not offered to

pay them as such damages any sum whatever.

Wherefore your petitioners pray and petition this Honorable Court for the assessment of their said damages from the said taking of the said waters of Sudbury river and Farm pond, conformably to law, and that after due notice and summons to the said City of Boston, this Honorable Court will appoint upon default or hearing of the said City of Boston three judicious and disinterested freeholders of this Commonwealth, who shall assess said damage according to law, and that all such and other proceedings may be had in the case as to law and justice shall appertain.

CHARLES P. TALBOT. THOMAS TALBOT.

May 29, A. D. 1875.

Mr. Somerby. This was filed in Court, May 31st, 1875. The answer is as follows:—

COMMONWEALTH OF MASSACHUSETTS.

MIDDLESEX, SS.

CHAS. P. TALBOT ET ALS., PETITIONERS FOR DAMAGES AGAINST THE CITY OF BOSTON.

1. And now come said City of Boston, and for answer to the allegations of said petitioners say, that they admit it to be true,

as therein averred, that the petitioners were in possession of the land therein described at the times therein set forth, but said defendants deny that the petitioners were the lawful owners of the water-power therein described, and require them to make such proof, as they are advised, of the ownership of such water-power on the Concord river.

2. And the defendants, further answering, admit that the Sudbury river is one of the branches and tributaries of said Concord river, and the waters thereof, and the streams running into the same would naturally flow into said Concord river, and flow into and make a part of a head of water raised by a dam at Billerica,

as set forth in said Chas. P. Talbot, et als., petition.

3. The defendants, further answering, aver that said Chas. P. Talbot, et als., do not own any rights in said water-power, except it may be certain indefinite rights in common with other parties who have suffered damages jointly with them, if any, by the alleged taking, or any taking of the water of Sudbury river by the City of Boston, and the defendants claim that this petition for damages for the taking of the water of Sudbury river by said Boston, under and by virtue of the act of the Legislature, as set out in the petition, should have been brought by the petitioners jointly with Faulkners', of said Billerica, and others to the defendants unknown, who claim to own rights in said water-power, subject to certain rights, reservations and conditions therein to the town of Billerica, who are all jointly owners, or jointly interested in common, and not in severalty in said water-power with said petitioners; and said petition of said Chas. P. Talbot, et als., if it may be sustained at all, should be jointly with the other owners, in common of said waters and water-power, who claim damages against said city, because of the taking of said water, and not severally by each, because the defendants say that the water-power of said Concord river, at said Billerica, being undivided, it would be exceedingly burdensome and expensive to said defendants to be called upon to divide and show how the taking of said water of Sudbury river would affect the owners and claimants of the water severally, so as to protect themselves against the several claims of each owner therein. And they therefore pray the Court that the petition may be dismissed for non-joinder of the other owners of said water-power, or that all of the owners of any rights in said water-power, created by said dam at said Billerica, may be ordered to come in and join as parties in said petition, so that there shall be but one assessment of damages for one act of taking by said city of said water, and a joint injury thereby to said water-power owned by the parties aforesaid at said Billerica.

4. And the defendants, further answering, deny that they have taken and diverted and withdrawn any of the waters of Sudbury river before the filing of said petition under the authority conferred by said act, set forth in said petition, in the manner and form therein set forth, or otherwise by said city acting under and

by virtue of the authority of said act.

5. And the defendants, further answering, say that said petitioners, and the owners of said water-power at said Billerica, on

the Concord river, are not, and will not be damnified by the taking of the water of Sudbury river under said act, nor do they have any right therein or thereto, because they say that by the act of the General Court of Massachusetts, passed June 22, 1793, to which, with the acts additional thereto, the defendants beg leave to refer as part of their answer, certain persons therein named were incorporated by the name of the "Proprietors of the Middlesex Canal," as a perpetual corporation for the sole object of uniting the waters of the Merrimack river in said Middlesex county, with the waters of the Medford river in said county, by cutting a canal for that purpose, "provided that whereas it may be necessary in the prosecution of the foregoing business that the property of private persons may, as in the case of highways, be appropriated to public use."

It was also enacted therein that in the case wherein any person shall be damaged in his property by said proprietors in any manner, if said proprietors do not make or tender reasonable satisfaction to the acceptance of the persons damaged by them, such persons may apply within one year for a committee to estimate the damages so done; and such proceedings shall be had, that a committee should be appointed to estimate the damages and make return thereof to the next Court of General Sessions of the Peace, and that execution should issue thereon with a right of appeal to a jury for an increase of said damages.

And the jury or committee, as the case might be, were empowered to give either a sum in gross for damages, or annual damages during the continuance of said damage, and the party injured was to

have judgment and execution thereon.

And it was also further enacted that the proprietors were authorized and empowered to purchase and hold to themselves and their successors forever, so much land and real estate as may be necessary for the purpose aforesaid, not exceeding the value of $\pounds 5,000$; "provided that no water-course shall be turned or altered, where any mill is erected, so as to injure such mill, without license therefor first had and obtained from the General Sessions of the Peace in the county through which said water-course may pass. And that the said Court, on application made to it by said proprietors, shall observe the same rules as are now prescribed by law when application is made to them for granting a public highway."

And the defendants further say that by an act in addition to the act above referred to, passed on the 28th day of February in the year 1795, it was enacted that "the property of said proprietors in said canal, and in any other canal connected therewith which they shall effect pursuant to the authority of the government, and all real estate of said corporation of which the said corporation shall be seized, shall be divided into eight hundred shares," which were to be personal property for certain purposes; and it was further therein enacted by the second section of said act "that said corporation shall have power to receive and hold real estate as appendant to said canal, and for the purpose of facilitating its business, to the sum of £30,000, over and above the value of the canal itself, simply considered;" and they were further empowered

to make the waters of the Concord river boatable as far as Sudbury causeway, and as much further as the same can be usefully improved for that end; and to open any canal at any place in said County of Middlesex that may be necessary to connect the Concord river with said canal for that purpose, and that the proprietors shall be liable to have damages recovered against them by any individual who shall be injured or damnified in his property in such new canal, by the same mode of process and in the same manner as is in the same act provided.

And said defendants, further answering, say that under said act of incorporation, surveys being made, it was found that it was impossible, without great and inordinate expense, to take the waters of the Merrimack river through a canal to unite with the waters of the Medford river near Boston, because it appeared that the waters of said Merrimack river, at a point where they were to come into said canal, were some twenty or more feet lower than the waters of the Concord river at said Billerica, at the point where

the said canal must pass the same.

And the defendants, further answering, say that by an act, in addition to the several acts respecting the proprietors of the Middlesex Canal, passed June 25, 1798, it appears that "whereas by an act passed February 28th, 1795, it is provided and enacted that the corporation of the said Middlesex Canal shall be empowered to hold real estate, as appendant to said canal, for the purpose of facilitating the business of the same to the value of £30,000 over and above the value of the canal itself. And the proprietors of said canal, having expressed their doubts whether in virtue of said act they may erect and hold mills on the same canal, and on the waters with which it is or shall be connected; it is enacted that the corporation of the Middlesex Canal, or the proprietors of said canal, in their corporate capacity, shall be empowered to purchase and hold any mill-seats on the waters connected with the same canal, and lands to accommodate the same, and thereon to erect mills."

And the defendants, further answering, say that by an act, in addition to the several acts passed respecting the Middlesex Canal, passed January 26, 1800, it is recited "that the proprietors of the canal have in their petition set forth that from a reservation in the acts already passed in their favor, the government has a right to regulate the toll of goods carried on the canal anew after the expiration of forty years, from which provisions great discouragements and embarrassments have resulted in the execution of that project; therefore be it enacted that a toll of one-sixteenth part of a dollar for each ton carried one mile on the same canal be established for said proprietors and their successors forever."

And that afterwards, by an act, in addition to the acts incorporating the proprietors of the Middlesex Canal, passed March 2, 1803, said proprietors were allowed the term of three years from and after the 22d day of June the next, to complete the same canal to Charles river, and to effectuate means of communication between said canal and the town of Boston across said Charles river by boats, and were allowed the further term of six years to

render Concord river boatableand navigable, and for cutting their

canals in the County of Middlesex.

And the defendants, further answering, say that in 1798, after the passage of said act of that year, the proprietors of the Middlesex Canal purchased said mill privileges on the Concord river at Billerica, and erected a dam for the purpose of raising a head of water to supply their canal, using the surplus to operate their mills, the grist-mill formerly on said stream having the first right; that in 1804 they completed their canal from Merrimack river to Charles river, and opened it for public navigation, taking toll therefor, using the head of water so raised in Concord river to feed their canal, and the surplus, whenever any there was, to run their said mills.

And the defendants, further answering, say that in 1826, finding their dam insufficient to raise the water for their purposes, said proprietors built a new and more permanent dam in connection with the old one, which is the dam now maintained by said

petitioners.

And the defendants, further answering, say that from the year 1804 down to the year 1851 the proprietors carried on their canal, using in the dry season all the water of the river for keeping up the navigation on their canal, and the surplus for their own mills, the canal retaining the first right thereto, and the same proprietors claim to hold and have the right to use all the water of said river for the purposes of navigation, and the rights of the public therein until the same may be lawfully discontinued; and that afterwards they applied for leave to wind up their affairs, to the Supreme Judicial Court sitting in and for the County of Suffolk, which leave was refused and their petition dismissed, and all said water is still held for a public use.

And the defendants, further answering, say that all the water of the Concord river, including that of Sudbury river, was taken, held, and appropriated forever to the public use; to wit, to be diverted from said Concord river, and was so diverted into Charles river, and the Merrimack river, to furnish means of navigation in a public canal, opening above said dam, and that damages were paid for such public use of said water, to all persons having any right

therein, and injured by such diversion.

And the defendants, further answering, say that the proprietors of said Middlesex canal had not, under their charter and the several acts in addition thereto, any right or power to sell, convey or assign any right to any person whomsoever, to use said water as against any other public use of the same, which taking of said water by the City of Boston is for a public use.

And the defendants, further answering, say that said Middlesex Canal only took by purchase or otherwise the lands, waters and water-power incident and appertaining thereto and connected therewith to "themselves and their successors for a public use forever," as a public corporation, and not with power to assign, sell, hold or make profit out of the same after they had ceased to exercise their rights for a public use under their charter, or surrendered their charter, and that said mill privileges and all rights purchased by

them became and were real estate or property of the shareholders of said canal, except in so far only as the several shares became personal property for certain purposes set forth in said acts, and are now the property of said shareholders if the said real estate has not reverted to its original owners.

And said defendants, further answering, say that said petitioners have no other or different rights in said water-power than those which the proprietors of said Middlesex Canal have, or which said proprietors have lost through the forfeiture of their charter, if the same is forfeited, or may be forfeited, for non-use.

Wherefore the defendants ask to be dismissed of this petition, and go thereof without day, and for their reasonable costs in this

behalf sustained.

BENJ. F. BUTLER,

Attorney and of Counsel for the City of Boston. Filed Feb. 10, 1876.

OPENING ARGUMENT OF MR. SOMERBY FOR THE PETITIONERS.

This, may it please your Honors, is the petition of the Messrs. Talbot for water which they say has been diverted by the City of Boston at the dam at their place, in Framingham. And I suppose there can be no doubt that the dam that the petitioners now occupy is the one formerly occupied by the Middlesex Canal, — a deed having been made to it from the corporation (which will be read by and by), in the year 1851. I suppose it is equally plain also, from the answer which I have read, and without attempting to construe it, that the Middlesex Canal, as a corporation, had a right to take what was given it by the Legislature, and to own and hold more or less mill-power and land; and perhaps this would not be disputed by the other side.

The counsel for the City of Boston claim that the Middlesex Canal held it only as appurtenant, and therefore that they cannot hold it in fee, so as to convey, sell or assign it.

The title which we claim to this dam (because the title here is disputed) came originally in 1708, from the town of Billerica, to one Christopher Osgood, subject, however, to the right on the part of the town of Billerica and the liability on the part of Mr. Osgood to grind the corn for the inhabitants of Billerica. That right, afterwards, either directly or through mesne conveyances, was sold to one Richardson, and afterward purchased, by authority of the act of the Legislature which I have mentioned, by the Middlesex Canal in 1794, or whenever purchased. That act was substantially confirmed by the Legislature, so that the petitioners own it as Richardson did, also subject to the right as before; for this right continued until it was finally extinguished (as I will mention

by and by), to grind corn for the inhabitants of Billerica. The Middlesex Canal did, I suppose, use the water to some extent, or perhaps to a very large extent, for the purpose of filling their canal; and they made this conveyance in 1851, subject, so far as the Middlesex Canal was concerned, merely to the right of using the water for purposes of navigation. Every other right, I think it will be found by the deed, was conveyed to the Messrs. Talbot, the petitioners, and from that time to this they have been in entire possession of the land undisturbed, claiming under this deed, paying the taxes, using the property, — having all the apparent rights of ownership that anybody could have, to land, water-power and

water-privileges.

The Middlesex Canal, prior to their conveyance in 1851 to Messrs. Talbot, the petitioners, had made several, or two or three, more or less, sub-grants of water-power, but always subject to the conditions, first of grinding this grain for the inhabitants of Billerica, and second, subject to the use of the Those rights, or sub-rights, were after-Middlesex Canal. wards extinguished by a conveyance from them in 1857, or some time near that, to Messrs. Talbot, the petitioners. And, after this also, the town of Billerica, by a vote, released the right on the part of the Messrs. Talbot for the liability to grind this corn. So that our general claim is that when the City of Boston took this water, in 1872, they took it from parties who had been in possession more than the legal time to obtain the title by prescription; that they were in possession, claiming by a deed; that they were in possession by deed directly from the Middlesex Canal, who we claim had a right to give it; and that every other right which was outstanding had been cancelled or annulled by the conveyance of the several parties to the petitioners. In 1857, — perhaps I should say in order for a proper understanding of it, — for although we try the cases separately, they are so intimately blended that in stating one I shall have to state the other, to a certain extent, —in 1857, the title being, as I have mentioned, in the Talbots, they at that time granted the right to the Faulkners (who are also petitioners here), and that right your Honors will have to understand, which I think is this: A bolt which was shown the commissioners was the exact height of the dam. The water was divided in this way, when the water was above the bolt and when it was below the bolt, or $\frac{3}{4}$ of an inch below the bolt (not to say exactly), — which would be, of course, $\frac{3}{4}$ of an inch below the top of the dam, strictly speaking, the flash-boards of the dam. Before the water got down to 3 of an inch below the top of the bolt the Messrs. Talbot had a right to draw whatever they pleased, — such water as they could use

in their mill. And the Faulkners, by the grant I have mentioned, had a right to draw $57\frac{3}{10}$ cubic feet per second until the water had arrived at the point $\frac{3}{4}$ of an inch below the bolt. When it arrived at that point the Faulkners' right ceased. Whilst the water was above the point 3 of an inch below the bolt, the Faulkners had the right to draw $57\frac{3}{10}$ cubic feet per second, the Talbots had an unlimited right, that is to say, to draw all that their works needed. When the water got to that point the Faulkners' right ceased; and the Messrs. Talbots' right was limited to about 434 cubic feet per second, or very nearly that; that being the amount, as we estimate, or as we have ascertained as well as we might, which could pass through certain gates of a given dimension, which are set forth in the deposition, which we shall refer to and read. That, of course, will be a matter of computation, but I only make that as a general statement.

So that we claim that this right of the Messrs. Talbot, subject to the right of the Faulkners, as I have stated, would be substantially this: that for the dry part of the year — call it the summer months — Messrs. Talbot would have water sufficient to drive the woollen mill which you see there, which would be equal to about 200 horse-power substantially, we say, all the time. And I believe that is so, with the exception of once or twice in the exceptionally dry winter of 1875. I believe then they had to stop for a very short time; but "substantially," it might be fairly said; — and of course we have got to look at things for all time, for they have got to be settled once for all time; — substantially, you might as well say, that they have water-power enough, so as to carry the flannel-mill actually during any part of the year. And not only that, but in the night also, they had sufficient power, so that to a very considerable extent they could use their mills for cutting up dye-wood. They could do so to an extent, so that the pond could fill up by morning, and be ready to afford the supply again for the day. That would be a fair measure, as we say, of what the Faulkners and the Talbots would have in the summer. That is the measure of what we say the Talbots are entitled to. now the question would come, How much have the city taken from that? How much have they diminished it? Well, of course, it could not be ascertained to a drop, nor ascertained specifically or exactly, and none of these things are, on the one side or the other. But we claim that we can get to it substantially; and we say that by taking the water-shed that has been put in in the Essex Company's case, and which would include, of course, all on this branch of the river to its source, that if we take from that sum the amount of watershed between the dam of the Messrs. Talbot and the Wamesit dam, it would leave us the power from a water-shed of 346 square miles in all, and that is what we say would be the efficient power (whatever it may be) of the Talbots' dam. Of course there will be no substantial dispute about there being eleven feet of fall there. That is what our claim is, — 346 square miles in all, — of the water-shed at the Talbot dam. You see, then, that what the city have taken is equivalent to 72 square miles, or substantially to one-fifth of that water-shed; and in that calculation we make it against ourselves if we allow that fraction, because it is proved (and I think the fact will be so taken by your Honors) that if the 72 miles of water-shed is compared with the other water-shed, it is more productive. But call it all alike, as we do in our calculation. The question then is (if we are right about it), "What shall be allowed in money to maintain at the Talbot dam a water-power which would come from a water-shed of 72 square miles? And in this calculation, of course, we say, as was argued here by the learned counsel for the Essex Company this morning, that the City of Boston, whether they take it or not, have the right to take all the water; and whether they take it now or whenever they shall take it is of no consequence, the damage is to be settled now. And, as it is very plain to see, as all the water is given them by the Act of the Legislature, and as they have the control of the Cochituate reservoir and lake, and also of the Chestnut Hill reservoir, it is a matter of no importance to talk about whether the water runs over Cochituate dam or not — for it can run over or not, just as they say — and all they have got to do is to use one or the other, as they please. So we claim that they are looking forward, not merely as to how they may use it to-day, or how they may use it twenty years, or fifty years, or even a hundred years hence, but how they may forever use it. And as all the water is given them, and we can have our damages but once, that we are deprived absolutely of this water-shed. Now, then, we claim that this water-shed would supply (and of course we have got to get at that as well as we may, but we take it for a series of years), what is equivalent at this dam, of eleven feet, to 100 or 125 horse-power, and that that would have to be sustained probably for as much as six months of the year. In other words, if a steam-engine were put in there, built by the city, and put in to run forever and kept in constant use, according to the way that mills are worked, we claim that that would only make them whole, and they would be no better off than they are to-day without it.

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That is our claim. Of course, to get at that, we have to take as the elements the height of the dam, the probable yield of the water-shed, the length of time, the diminution of the water, and of course the cost and expense that it would take to sustain the engine. All that will be a matter of proof and a matter of argument, which I shall come to by and by. Of course the matter of the working out of this calculation will be left to the proof, and to the remarks of the senior counsel. All I wish to state is the propositions, that they may be understood before we go forward.

[Recess till $1\frac{1}{2}$ o'clock, P. M.]

AFTERNOON SESSION.

Mr. Abbott. I put in in the first place (which Gen. Butler agrees may be put in without calling the surveyor, Mr. Worcester, who was a witness before), a certificate in reference to the survey of the water-shed at Billerica. The area is 346 square miles.

Then we put in a deed from the proprietors of the Middlesex Canal, dated the 22d day of September, 1851, acknowledged on the 13th day of October, 1851, and recorded

October 23d, 1851.

[Middlesex Deeds, Book 618, p. 97.]

MIDDLESEX CANAL COMPANY TO C. P. TALBOT & CO.

Know all men by these presents, That the Proprietors of the Middlesex Canal, a Corporation established by authority of the Commonwealth of Massachusetts, in consideration of Twenty Thousand Dollars paid by Charles P. Talbot, of Lowell, and Thomas Talbot, of Billerica, in the County of Middlesex and Commonwealth of Massachusetts, Manufacturers and Copartners, the receipt whereof is hereby acknowledged, do hereby bargain, sell, remise, release, and forever quit claim unto said Charles P. and Thomas Talbot, their heirs and assigns, eleven pieces or parcels of land lying in the town of Billerica, in said County and Commonwealth, subject, however, to the use hereinafter mentioned, as follows, viz.: The first piece or parcel of land lies in the town of Billerica, and begins at the southeast corner of the Bridge over the Canal, at the abutment, and runs a southerly course one hundred and seventy-two feet, more or less, to the northeast corner of Joel Dix's land; thence southerly again, a little more easterly, by land of said Dix, one hundred and sixty-two feet, more or less, to a stake; thence the line turns nearly a right angle and runs an easterly course by the stone wall eightyseven feet, more or less, to the Cuncord river; thence a northerly course by the river, thirty feet, more or less, to a stake; thence the line turns and runs a northeasterly course, by said river, one hundred and nineteen feet, more or less, to a bend in the riverr; thence the line runs a northerly course one hundred and twenty-one feet, more or less, by the river, to the northeast corner of a wooden store-house or building; thence northerly by the river, on rather of a curved line to the northerly side of the towing path or floating bridge one hundred feet, more or less; thence a westerly course one hundred and thirty-eight feet, more or less, to the bound of beginning, containing by estimation forty-eight thousand feet, more or less; reference to be had to a plan drawn by R. H. Eddy, dated September 12, 1850, and hereto annexed, and herewith to be recorded; the lot above described is marked A on said plan, and with all the rights and privileges to the said lot of land belonging, and likewise all the rights of the Proprietors of the Middlesex Canal, now hold in a piece of common land which lies in front of the estates of Joel Dix and Daniel Wilson, and others, according to a deed of the Proprietors of the Canal to Jonathan Farmer, dated August 1st, 1855, recorded in Middlesex Registry, Book 240,

The second piece or parcel of land lies in the town of Billerica, . is bounded and described as follows, viz.: Beginning at the same place as the last described piece at the southeast corner of the Canal bridge, and from thence the line runs by the northerly side of the towing-path, on the southerly side of the canal, an easterly course, one hundred and thirty-eight feet, more or less; thence the line turns and runs a northwesterly course, crossing the canal, seventy feet, more or less, to the most easterly point in the wharf by Concord river; thence the line runs a northwesterly course by said river, and by said wharf, eighty-eight feet, more or less, to a point which is one hundred and thirty feet from the point of beginning; thence the line turns and runs a southerly course by the roadway, one hundred and thirty feet, more or less, to the bound of beginning. The above described piece or parcel of land is marked B on a plan drawn by R. H. Eddy, dated September 12, 1850, to which reference may be had; the said lot of land contains, by estimation, nine thousand six hundred and thirteen feet,

The third piece or parcel of land lies in the town of Billerica, and is bounded and described as follows, viz.: Beginning at the southwest corner of the Bridge over Concord River, near the Milldam, and from thence the line runs a westerly course by the river, one hundred and eight feet, more or less; thence the line curves and runs by said River thirty-four feet, more or less; thence the line runs a southerly course by said River to the southwesterly corner of the saw mill, or to the stone wall, one hundred and twenty-five feet, more or less; from thence the line turns at nearly a right angle, and runs a westerly course by a stone wall, and by said Concord River, one hundred and seventy-two feet, more or less; thence the line turns at nearly a right angle and runs a southerly course by said river and stone wall seventy-two feet, more or less, to the northeast corner of the Dye House and Canal waste-way; thence the line turns at nearly a right angle and runs a westerly course by said river and bank of the canal, on hundred and ninety feet, more or less, to a stake and stones; thence the line turns at DEED. 365

nearly a right angle and runs a southerly or southeasterly course, crossing the canal, and partly by land of John Mixer, two hundred and sixteen feet, more or less, to the county road leading to the mills; from thence the line turns at nearly a right angle and runs an easterly course by said county road, two hundred and seventy feet, more or less, to a post driven in the ground at a curve in the road; from thence the line runs a northeasterly course, one hundred and five feet to a stake near the southwesterly corner of the bridge over the canal; from thence the line runs a more northerly course by the canal bridge and county road one hundred and twentyeight feet, more or less, to the southeasterly corner of the millbason; from thence the line runs a northerly course, through said bason, by the bridge and county road, one hundred and forty-five feet, more or less, to the bound of beginning. The above described piece or parcel of land is marked C on a plan drawn by R. H. Eddy, dated September 12, 1850, and contains, by estimation, ninety-eight thousand four hundred and thirty-six square feet, more or less, with all the buildings thereon standing.

The fourth piece or parcel of land lies in the town of Billerica, and is bounded and described as follows, viz.: Beginning at the northeast corner of the land sold by the proprietors of the Middlesex Canal to John Mixer, of Billerica, and near the northwest corner of the barn on the last described lot of land; from thence the line runs a northerly course, crossing the canal, ninety-two feet, more or less, to the Concord river; thence the line turns and runs a westerly course by said river, two hundred and ten feet, more or less; thence the line turns and runs a southerly course, crossing the canal, one hundred feet, more or less, to the northwest corner of land the proprietors of the Middlesex canal sold John Mixer; from thence the line turns and runs an easterly course, two hundred and five feet by the southerly side of the This last described piece towing path to the bound of beginning. or parcel of land is marked D on a plan drawn by R. H. Eddy, dated September 12, 1850, and contains, by estimation, eighteen

thousand five hundred and eighty-four feet, more or less.

The fifth piece or parcel of land lies in the town of Billerica, and is bounded and described as follows, viz.: Beginning at the northwest corner of the last described piece or parcel of land, by the Concord river, and running a west-northwesterly course by said river one hundred and fifty-two feet, more or less; passing by the guard-gates, from thence the line turns and runs a southerly course, crossing the canal, one hundred and thirteen feet, more or less, to the northwesterly corner of a piece of land the Proprietors of the Middlesex Canal sold to Israel Colson; from thence the line turns and runs an easterly course, or southeasterly course, by land of said Colson, one hundred and forty-eight feet, to a stake at the northwesterly corner of land of John Mixer; from thence the line turns and runs a northerly course, crossing the canal, one hundred feet, more or less, to the Concord river, the bound of beginning. last described piece or parcel of land is marked E on a plan drawn by R. H. Eddy, dated September 12, 1850, and contains by estimation, thirteen thousand three hundred and seventy feet, more or less.

The sixth piece or parcel of land lies in the town of Billerica, and is bounded and described as follows, viz.: Beginning by the county road leading to the mills, at the southwest corner of land the proprietors of the Middlesex Canal sold to Israel Colson, and partly by the last described piece of land, three hundred and fiftythree feet, more or less, crossing the canal to the Concord river; from thence the line turns and runs by the Concord river, at the foot of the canal bank, two hundred and fifteen feet, more or less, to a stake by the southerly side of said river; thence the line runs a little more northerly, by said river, one hundred feet, more or less, to a stake by the southerly side of said river; thence the line is somewhat curved, and runs by said river one hundred and five feet, more or less, to the northern or lower end of the canal lock at said river; thence the line runs a westerly course by the northeasterly end of said canal lock, seventeen feet, more or less, to the westerly side of said lock; from thence the line runs a northeasterly course, by the Concord river, ninety feet, more or less; from thence the line turns and runs a westerly course, one hundred and fifteen feet, more or less, to the private roadway of the late Farmer; from thence the line turns at nearly a right angle and runs a southerly course by said private roadway, crossing the canal, to a point near the southeasterly end of Farmer's Bridge, two hundred and fiftytwo feet, more or less; from thence the line runs south a little easterly by the road, eighty-six feet, more or less, to a private way laid out overland belonging to the proprietors of the Middlesex Canal; from thence the line turns and runs southeasterly, by said private way, five hundred and eighty-seven feet, more or less, to the bound of beginning. This last named lot of land is laid down on a plan drawn by R. H. Eddy, dated September 12, 1850, and is marked on said plan F, and contains by estimation, one hundred and eighteen thousand three hundred and sixty-three feet, more or less.

The seventh piece or parcel of land lies in the town of Billerica, and is bounded and described as follows, viz.: Beginning at a point by the county road leading to the mill, just fifty-one feet westerly of the southwesterly corner of the land the proprietors of the Middlesex Canal sold to Israel Colson; and from thence the line runs a westerly course, by the said county road, three hundred and sixty-two feet, more or less, to a stake and stones northeasterly from said Colson's house; from thence the line curves and runs ninety feet, more or less, to a stake and stones on the road leading to the canal; from thence the line runs a northerly course, three hundred and forty-five feet, more or less, to the private way laid out by the proprietors of the Middlesex Canal; from thence the line turns and runs by said private way, five hundred and twenty-three feet, more or less, to the county road at the point of beginning. The last named piece or parcel of land is marked G on a plan drawn by R. H. Eddy, dated September 12, 1850, and contains, by estimation, eighty-four thousand one hundred and thirteen feet, more or less.

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The eighth piece or parcel of land lies in the town of Billerica, and is bounded and described as follows, viz.: Beginning at the southwesterly corner of land the proprietors of the Middlesex Canal sold to Israel Colson, and runs a northwesterly course by the private way laid out by the proprietors of the Middlesex Canal, five hundred and eighty-seven feet, more or less, to the road leading by Colson's house to the canal; from thence, the line turns and runs a southerly course, fitfy-one feet, more or less, by the last-named road; thence, the line turns and runs southeasterly, five hundred and twenty-three feet, more or less, to the county road leading to the mills; thence, by said county road fifty-one feet, more or less, to the bound of beginning. The last named piece or parcel of land is laid down on a plan drawn by R. H. Eddy, dated September 12, 1850, is marked H on said plan, and contains by estimation, twenty-two thousand two hundred feet, more or less.

The ninth piece or parcel of land lies in the town of Billerica, and is bounded and described as follows: Easterly by the road near William Rogers' house; northerly by the land of said proprietors; westerly by the mill-pond, so called; southerly by land formerly of Jonathan Pollard, an elm tree standing in a line of the first-mentioned bound, containing by estimation, one acre, more or less, with the buildings thereon standing; and for a more particular description, reference is to be had to the deed of Jonathan Pollard, to the proprietors of the Middlesex Canal, dated March 25, 1795, and recorded in the Middlesex Registry, Book 118, Page 213. This last named lot is marked I, on a plan drawn by

R. H. Eddy, dated September 8th, 1851.

The tenth piece or parcel of land lies in the town of Billerica, and is bounded and described as follows, viz.: Beginning at a stake and stones opposite the westerly end of William Rogers' dwelling-house, on the westerly side of the road which leads from the mills to Billerica Meeting-house, just five rods distant from the wall on the north side of the trunk of the canal, as now stoned up from said stake and stones, the line runs a northwesterly course by land of said Rogers, keeping just five rods distant from the said wall on the north side of the trunk of the canal, continuing or extending into the mill pond or Concord river; thence, keeping the same distance of five rods from the canal agreeably to the course thereof, as far westward as said Rogers' land extended, and as far as he had a right to sell to the proprietors of the said canal; thence westerly by said Concord river until it comes to Jonathan Pollard land, or land which he sold to the proprietors of the canal; then the line turns and runs eastwardly by the land which the said proprietors purchased of said Pollard, until it comes to the road before mentioned; then the line turns and runs northerly by the said road to the bound first mentioned, containing by estimation one and one-quarter of an acre, more or less. And for a more particular description reference may had be had to the deed of William Rogers, dated Dec. 21, 1779, recorded in Middlesex Registry, Book 143, Page 118.

The eleventh piece or parcel of land lies in the town of Billerica, and is bounded and described as follows, viz.: Beginning at a

stake and stones by the easterly side of road, just four rods from the southwesterly corner of William Rogers' dwelling-house, from the said stake and stones the line runs an easterly course by land of said Rogers, about seventeen rods to a stake and stones which is placed just ten and one-half rods from the centre line of the Middlesex Canal, measuring at right angles from the said centre line; thence from said stake and stones last mentioned, the line turns and runs a more southeasterly course exactly parallel with the said centre line, and just ten and one-half rods distant from it, having said Rogers' other land on the north of the premises until it comes to the Jonas Saunders' road, so called; then the line turns and runs a southerly course, having said Jonas Saunders' road on the east, croising the canal at the bridge and extending southerly to a stake and stones ten rods from said centre line of the canal, measuring at right angles from it; from thence the line turns and runs northwesterly, keeping ten rods from said centre line of the canal to a stake and stones by a pond-hole, and about seventeen rods to a stake and stones at the first mentioned road; from thence the line turns and runs a north-northeasterly course by the east side of said road, crossing the canal to the bound first mentioned, with all the privileges and appurtenances to the premises belong-. ing, and containing by estimation, twenty acres and five rods. The above described piece or parcel of land was purchased of William Rogers by his deed, dated Dec. 21, 1799, and is recorded in the Middlesex Registry, Book 143, Page 118, to which reference may be had and likewise to a plan drawn by R. H. Eddy, dated September 8th, 1851.

And whereas, the Middlesex Canal passes over and through each of the above-described parcels of land, the same are hereby conveyed subject expressly to the reservation of all easements and services necessary for or incident to the preservation and use of said canal, for the purpose of navigation and of all rights of the public therein, until the same shall be lawfully discon-

tinued.

And further, the said proprietors of the Middlesex Canal do hereby bargain, sall, remise, release and forever quit claim to the said Charles P. Talbot and Thomas Talbot, their heirs and assigns, all the right, title, interest and estate, held by the said corporation under the deed of Thomas Richardson, dated March 25, 1794, recorded in the Middlesex Deeds, Book 115, Page 258, in and to the use of the waters of Concord river, and the mill privileges thereto belonging, subject to the conditions contained in said deed, and to the prior grants of said corporation to Francis Faulkner, by deed dated May 4th, 1825, recorded with Middlesex Deeds, Book 260, Page 48; and to Nathan Mears, by deed dated March 15, 1826, recorded with Middlesex Deeds, Book 265, Page 202, and subject also to the conditions hereinafter set forth.

To have and to hold the above released premises with all the privileges and appurtenances excepting as aforesaid, to the said Charles P. and Thomas Talbot, their heirs and assigns, to their sole use and behoof forever. But upon the express condition that the said grantees shall perform all the duties and obligations

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towards the town of Billerica, which the said grantors are bound to perform by virtue of the vote of the inhabitants of said town, referred to in the deed of said Thomas Richardson, and all other conditions set forth in said deed; and also, that the said grantees shall not, whensoever forbidden so to do by said corporation, in writing signed by their agent, and until said canal shall be lawfully discontinued, draw the waters of said river lower than three-fourths of an inch below the tops of the flash board on the stone dam (the lawful height of said flash boards being fixed by the top of an iron pin driven into a fast rock at the side of the river, near said dam, which is referred to, to determine the point below which the said waters shall not be drawn), and on the further condition that the said grantees shall after the discontinuane of said canal, either maintain and keep in good repair at their own expense, the two canal bridges southerly of the Concord river adjoining lands above described, or else shall take down the said bridges and fill up said canal under the same, and make thereon in the place of said bridges a good sufficient road way to the satisfaction of the town of Billerica; the said grantees to have for their own use and benefit all the stone and materials of which said bridges are composed. And the said corporation do hereby covenant to and with the said Charles P. and Thomas Talbot, their heirs and assigns, that the above released premises are free from all incumbrances, except as aforesaid made or suffered by the said corporation, or any of its officers and that the said corporation will warrant and defend the same premises to the said Charles P. and Thomas Talbot, their heirs and asssigns, against the lawful claims and demands of all persons, claiming by, through, or under said corporation, except for breach of condition as aforesaid, and against none other.

In witness whereof, Ebenezer Chadwick, in his official capacity as President of the Middlesex Canal Corporation, hath hereunto set his hand and affixed the seal of the corporation, this twenty-second day of September, in the year of our Lord one thousand eight hundred and fifty-one. The words "thence the line turns and runs a southwesterly course by the roadway, one hundred and thirty feet, more or less, to the bound of beginning," interlined on the second

page before signing.

EBEN CHADWICK, Pres't. [SEAL.]

Signed, sealed and delivered in presence of

CALEB EDDY.

COMMONWEALTH OF MASSACHUSETTS.

Suffolk, ss.:

October 13, 1851.

Then personally appeared the within named Ebenezer Chadwick, and in his efficial capacity as President of the Middlesex Canal Corporation, acknowledged the aforegoing to be the free act and deed of said corporation, before me,

Approved.

EBEN CHADWICK, WM. APPLETON, WM. STURGIS,

MIDDLESEX, SS.:

October 23, 1851.

Received and recorded by

CALEB HAYDEN, Reg.

It is unnecessary to refer to the forfeiture of the charter, which has already been put in. Here is the quitclaim deed from the town of Billerica to Charles P. Talbot et al., dated March 25, 1864.

Know all men by these presents, that the inhabitants of the town of Billerica, in the County of Middlesex and Commonwealth of Massachusetts, a municipal corporation, in consideration of fifteen hundred dollars, paid by Charles P. Talbot, of Lowell, and Thomas Talbot, of said Billerica, both in said County of Middlesex, the receipt whereof is hereby acknowledged, do hereby convey, remise, release, and forever quitclaim unto the said Charles P. Talbot and Thomas Talbot, their heirs and assigns, all the right, title, and interest which said town of Billerica has in and to the real estate, privileges, easements, provisions, and conditions specified in a vote of said town passed at a general town meeting held October 4th, 1708, granting certain lands and rights to Christopher Osgood, jr., of Andover, as appears by the records of the town; hereby also releasing said C. P. Talbot and Thomas Talbot, their heirs and assigns, from all obligations to maintain a grist-mill as is provided in said last-named vote of said town.

To have and to hold the above-released premises, with all the privileges and appurtenances to the same belonging to the said Charles P. Talbot and Thomas Talbot, their heirs and assigns, to

their use and behoof forever.

And the said grantors, for themselves and their successors, do covenant with the said Charles P. and Thomas, their heirs and assigns, that the premises are free from all incumbrances made or suffered by said grantors; and that they will and their heirs, executors, and administrators shall warrant and defend the same to the said Charles P. and Thomas, their heirs and assigns forever, against the lawful claims and demands of all persons claiming by, through, or under said grantors, but against none other.

In witness whereof the said inhabitants, by Joshua Bennett, Gardner Parker and Amos Spaulding, and Dudley Foster, their committee, duly chosen and authorized, have affixed the corporate GRANT.

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name and seal of said town hereto, this twenty-fifth day of March, in the year one thousand eight hundred and sixty-four.

THE INHABITANTS OF THE TOWN OF BILLERICA,

[L. S.]

By
Joshua Bennett,
Gardner Parker,
Amos Spaulding,
Dudley Foster,
Their Committee,
duly authorized.

Signed, sealed, and delivered in presence of CHARLES H. PARKER.

Middlesex ss, March 28th, 1864. Then personally appeared the above-named, Joshua Bennett, Gardner Parker, Amos Spaulding, and Dudley Foster, and acknowledged the above instrument to be the free act and deed of the above named Inhabitants of the Town of Billerica.

CHARLES H. PARKER, Justice of the Peace.

Now I come to the grant of 1708 from the town of Billerica, which is the grant of the whole thing:—

GRANT TO OSGOOD.

At a general Town Meeting, Oct. 4th, 1708. Granted to Christopher Osgood, Jr., of Andover, all that neck of land, on the west side of Concord river, lying between said river and the pathway leading to broad meadow, with the stream at the falls, reserving ten poles from the fordway down said river, and from the foot of the hill going down into broad meadow; provided the said Christopher Osgood do, within two years next ensuing the date hereof, erect and maintain a good grist-mill upon said river, at the falls over against Samuel Rogers, his house lot, and the said Osgood doeth engage to secure and defend the town of Billerica, from any trouble and charge that may arise for damage that may be done to the meadows of the towns above us by said mill-dam; the said land is given and granted to the said Christopher Osgood and his heirs, by the town of Billerica, so long as they shall maintain a good grist-mill at said place; and when said mill ceases the said land shall return to the said town of Billerica.

Billerica Town Meeting, March 27, 1710. Voted, that the town of Billerica will defend Mr. Christopher Osgood from bearing any charge of the damage in flowing Dr. Toothacre meadow, by his mill-dam; said Osgood engaging, for himself and his successors, that the said stream that was granted to him shall return with the land to the said town of Billerica, when the said mill ceaseth which he holds said land and stream by. Passed in the affirmative, eight votes.

Jonathan Bacon, Josiah Bacon, and Josiah Fassett, entered their dissent against vote.

I next put in the deed from Thomas Richardson to the Middlesex Canal, dated March 25th, 1794.

THOMAS RICHARDSON TO MIDDLESEX CANAL, March 25th, 1794.

[Middlesex Deeds, Book 115, p. 258.]

Know all Men by these Presents, That I, Thomas Richardson, of Billerica, in the County of Middlesex and Commonwealth of Massachusetts, Gentleman, in Consideration of Thirteen Hundred and Fifty Pounds paid me by Ebenezer Hall of Medford, Gentleman, and Samuel Jaques of Wilmington, Yeoman, both in the County aforesaid, the receipt whereof I do hereby acknowledge, do hereby give, grant, sell, and convey, unto the said Ebenezer Hall and Samuel Jaques (who are a committee appointed by the Directors of the proprietors of the Middlesex Canal for this purpose), to be for the use and benefit of the Proprietors aforesaid, in their Corporate Capacity, and their Assigns, forever, the following Estate and on the following Conditions, viz.: About Forty Acres of land, be the same more or less, lying in said Billerica, and bounded, Eastwardly, by Concord River; Westerly, by the Highway or Road; Northerly and Southerly, by the Road aforesaid. Also, the Reversion of One-Half of the Dower set off to the Widow Hannah Carlton, which was conveyed to me by Solomon Carlton, Moses Carlton and Nathan Carlton. The whole of said Reversion of the Homestead is bounded as described by the return of the Commissioners for that purpose in the Probate office. Also, Five-Sixths part of a small piece of land, laying on the South side of the Road, containing about Six poles, more or less, being at the Northeast end of the Mill Dam, bounded, Easterly, by Timothy Sprague's Ditch, that conveys Water to the Fulling Mill; Northerly, by the Road; Westerly and Southerly, by Concord River; together with all the Buildings and Privileges to the above-described premises belonging, including the Mills, Mill-privileges and conveniences, thereunto belonging; being on the premises, and commonly known by the name of Richardson's Mills, being the same which was former granted by the town of Billerica, to Christopher Osgood, together with Mill-Dam and Stream. Provided, the said Proprietors and their Assigns, shall do and perform the same Conditions that I, the said Thomas Richardson, shall be oblidged to perform if I do not convey said Premises to said Proprietors, by Virtue of a Vote of said Town of Billerica, to Christopher Osgood, the fourth Day of October, 1708. Also, to keep a proper passage for Fish, agreeable to Law. Also, their fulfilling the agreement made by said Richardson, as set forth in his last Deed to Timothy Sprague, about the year 1791. Have and To Hold the afore-granted Premises to the said Proprietors and their Assigns, and to their own Use and Behoof forever, and on the Conditions aforesaid. And I do Covenant with the

said Proprietors, their Heirs and Assigns, that I am lawfully seized in Fee of the afore-granted premises; that they are free from all other incumbrances; that I have good right to sell and convey the same to the said Proprietors, to hold as aforesaid. And that I will Warrant and defend the same Premises to the said Proprietors, their Heirs and Assigns, forever, against all other lawful Claims and Demands of all Persons. In Witness whereof, I, the said Thomas Richardson, and Judith Richardson, the Wife of said Thomas, in testimony of her free consent hereunto and release of Dower in the Premises, hereunto set our Hands and Seals, this twenty-fifth Day of March, in the Year of our Lord one thousand seven hundred and ninety-four. It is further to be understood, that one-half of the Dower as set off for said Widow, Hannah Carlton, is not hereby conveyed.

THOMAS RICHARDSON. [SEAL.]
JUDITH RICHARDSON. [SEAL.]

Signed, Sealed, and Delivered, in presence of us.

JONATHAN BROWN. HENRY PUTNAM.

MIDDLESEX, SS.:

MARCH 24th, 1794.

Then the above-named Thomas Richardson personally appeared and acknowledged the above-written instrument to be his act and deed, before

JONATHAN BROWN, Just. of Peace.

MIDDLESEX, SS.:

Cambridge, April 21st, 1794.

Received and entered by

WILLIAM WINTHROP Reg.

[Middlesex Deeds, Book 618, p. 97.]

This describes forty acres of these same lands.

Mr. Butler. You have not put in Osgood's deed to Richardson.

Mr. Abbott. No, sir; that deed never could be found. It is only recited here, being the same premises.

Commissioner Russell. That is a missing link.

Mr. Abbott. It is missing so far as any human knowledge that we have of it is concerned.

Now here is a certified copy of the vote of the town of Billerica, March 7th, 1864:—

At a legal town meeting held at Billerica, March 7th, 1864, the 14th article in the warrant calling said meeting was,—

"To see if the town will sell, release, and convey to C. P. and Thomas Talbot in fee simple all the right, title, and interest which the town has in and to the real estate, privileges, easements, provisions, and conditions specified in a vote of the town passed at a general town meeting held October 4th, 1708, granting certain land and rights to Christopher Osgood, jr., of Andover, as appears by the records of the town, including in such conveyance a release to said C. P. and Thomas Talbot, their heirs and assigns, from all and every obligation to maintain a grist-mill as is in said vote provided, and will authorize a proper conveyance and release of said real estate, privileges, easements, provisions, conditions, and obligations to be made and delivered to said C. P. and Thomas Talbot." The town voted to sell, release, and convey to C. P. Talbot and Thomas Talbot, in fee simple, all the right, title, and interest which the town of Billerica has in and to the real estate, privileges, easements, provisions, and conditions, referred to in Article 14th of the warrant for this meeting, and also to release said C. P. Talbot and Thomas Talbot, their heirs and assigns, from all obligations to maintain a grist-mill, as referred to in said article, for the sum of fifteen hundred dollars, to be paid by said C. P. Talbot and Thomas Talbot to said town. And that a committee of three shall be chosen by the town, who shall be authorized to make, execute, acknowledge and deliver in the name of the town, and all and every instrument or instruments necessary to carry into effect the above vote of the town. The town chose Joshua Bennett, Gardner Parker, and Amos Spaulding committee to carry into effect the above vote. The town voted to add Dudley Foster, Treasurer, to said committee.

Billerica, February 10th, 1876. I, Dudley Foster, Town Clerk of Billerica, hereby certify that the foregoing is a true transcript from Billerica Town Records.

DUDLEY FOSTER, Town Clerk.

The original grant, as you see, by the first vote is to maintain the dam and give the whole privileges, — the only point on that side of the river.

Now I propose to deal with the other grants.

[Mr. Abbot put in the following papers: Deed of Middle-sex Canal to Nathan Morse, March 20, 1826. Deed from Nathaniel Stearns, guardian to Edwin Mears and Charles Mears, minor children of Nathan Mears, etc., made March 20th, 1832. Deed from John Baldwin, guardian to Gardner Parker, March 2d, 1832.]

Then Gardner Parker, by deed of March 21st, 1832, acknowledged April 2d, 1832, conveyed these same premises, conveyed by both the deeds I have just put in, to Nathaniel Stearns of Billeriea. [Deed put in.]

Mr. Butler. The guardian sold to Parker, and Parker

sold back to the guardiau.

Mr. Abbott. I rather think that is so, sir.

Then Nathaniel Stearns, by his deed, dated the 22d of June, 1844, conveys to Charles P. Talbot and Thomas Talbot these same premises, describing them at length, for a

consideration of \$2,677.50. You see a small part of that had got to be pretty valuable at that time. [Deed put in.]

Then, sir, this same Stearns, and Mr. Baldwin, guardian of the children of Nathan Mears, sell to Francis Faulkner, in consideration of \$1,042, the right, title and interest of said minors to a certain tract of land situated at the canal mills in Billerica, with the building thereon, etc. [Deed, dated April 29, 1831, put in.]

Then, sir, Abner Kneeland, as guardian of James Rice, junior, conveys all this land, describing it in the same way, to Francis Faulkner. [Deed put in, dated 24th, 1836.]

Now, you see, Mr. Chairman, to keep along, I have got into Talbot's part of the lot conveyed to Mears. I have got in to him the reservation in behalf of the inhabitants of the town of Billerica. I have got the deed to Faulkner, the other part I have got, the other portion the Mears' lot conveyed to Francis Faulkner, so that now to deal with the Faulkners.

Mr. Butler. I would like to put in the testimony of one or two witnesses, in this report, about "the olden-time."

Mr. Abbot. If you will point out to me what you want to put in, I will see.

Mr. Butler. I will. It will save calling somebody.

Mr. Abbott. The executors of Francis Faulkner, Charles Faulkner and James R. Faulkner, two of his children, convey all these estates, that is, all that were conveyed to him by the Middlesex Canal, all that were conveyed to him by Kneeland, and conveyed to him by Stearns, at his deeease, to Luther R. Faulkner, by deed dated April convey to Luther W. Faulkner, another brother. Previous to that, however, I ought to state, Francis Faulkner conveys, in his lifetime, one undivided third part of this property to James R. Faulkner, one of the brothers; so that at the death of Francis Faulkner that property stood two-thirds in him. and one-third in James R. Faulkner. Then James R. Faulkner and Charles Faulkner, his executors, executors of Francis Faulkner, two of the children, convey those estates to Luther W. Faulkner, and it was a family settlement really, because Luther W. conveys back one undivided third to Charles, the gentleman here, and one undivided third to James R. Faulkner, so that the estate gets into James R. and Charles Faulkner. Then, sir, in 1857, James R. and Charles Faulkner convey all this estate, the first day of April, 1857, to Charles P. and Thomas Talbot, so that I now have, in 1857, all the estate in the two Talbots. deed is as follows: -

QUITCLAIM DEED.—JAMES R. FAULKNER ET AL. TO CHARLES P. TALBOT ET AL., APRIL 1, 1857.

Know all men by these presents, that we, James R. Faulkner, of Billerica, in the County of Middlesex and Commonwealth of Massachusetts, manufacturer, and Charles Faulkner, of Boston, in the County of Suffolk, in said Commonwealth, merchant, in consideration of twenty thousand dollars, paid by Charles P. Talbot, of Lowell, in said County of Middlesex, and Thomas Talbot, of said Billerica, merchants, the receipt whereof is hereby acknowledged, do hereby convey, remise, release, and forever quitclaim unto the said Charles P. Talbot and Thomas Talbot, their heirs and assigns forever, a certain piece or parcel of land, situated in the northerly part of said Billerica, with a brick factory and buildings thereon standing, bounded as follows, namely: Beginning at the road which passes in front of said factory, at the corner of said James R. Faulkner's house-lot, and running northerly, on said James R. Faulkner's land, until it comes parallel with the front of his dwelling-house; thence westerly three hundred feet to a stake and stones; thence southerly one hundred and forty feet to a stake and stones, at a little basin, so called, in Concord river; thence easterly, on the south side of said Factory creek, and on land of Nathaniel Stearns', now or formerly, to the road above mentioned; thence on said road to the bounds first mentioned, together with all the water-rights and privileges particularly described and set forth in the deed of the proprietors of the Middlesex Canal to the said Francis Faulkner, bearing date on the fourth day of May, A.D. 1825, and recorded in the Middlesex Registry of Deeds, book 260, page 248, and subject to the same restrictions granted and contained in said deed, together with all and singular the rights and privileges to the said premises belonging.

Also, a certain other lot of land, with a wooden factory thereon standing, situate nearly opposite the brick factory aforesaid, being the same premises conveyed to the said Francis Faulkner by Nathaniel Stearns and John Baldwin, guardians, by their deed bearing date on the twenty-ninth day of April, A.D. 1831, recorded in the Middlesex Registry of Deeds, book 305, page 44, to which reference is hereby made for a more particular description of the said premises; together with all the water-rights and privileges described and set forth in said deed of Stearns and Baldwin, but subject to the same reservations and restrictions granted and contained in said last-named deed, and together with all and singular the rights and privileges to the said premises belonging.

Also, a certain other lot of land, situated in the northerly part of Billerica aforesaid, near the bridge over Concord river, with the buildings thereon, called and known by the name of the "Blacksmith's Forge and Iron Works," being the same premises first described in the deed, by which Abner Kneeland, guardian, conveyed the same to the said Francis Faulkner, bearing date on the twenty-fourth day of May, A.D. 1836, and recorded in the Middlesex Registry of Deeds, book 353, page 514, to which reference is hereby made for a more particular description of the said

premises, together with all the water-rights and privileges contained, described and set forth in said deed from Abner Kneeland, but subject to the same reservations and restrictions granted and contained in the said deed of Kneeland, and together with all and singular the rights and privileges to the said premises belonging.

To have and to hold the above-released premises, with all the privileges and appurtenances to the same belonging, to the said Charles P. Talbot and Thomas Talbot, their heirs and assigns, to

them and their use and behoof forever.

And we, the said James R. Faulkner and Charles Faulkner, for ourselves and our heirs, executors and administrators, do covenant with the said Charles P. Talbot and Thomas Talbot, their heirs and assigns, that the premises are free from all incumbrances, made or suffered by us, and that we will, and our heirs, executors and administrators, shall warrant and defend the same to the said Charles P. Talbot and Thomas Talbot, their heirs and assigns forever, against the lawful claims and demands of all persons, claiming by, through, or under us, but against none other.

In witness whereof, we, the said James R. Faulkner and Charles Faulkner, together with Catherine Faulkner, wife of the said James R., and Annie S. Faulkner, wife of the said Charles, in token of their release of all right and title of or to dower in the granted premises have hereunto set our hands and seals this first day of April, in the year of our Lord eighteen hundred and

fifty-seven.

JAMES R. FAULKNER, CHARLES FAULKNER, CATHARINE FAULKNER, ANNIE S. FAULKNER.

Signed, sealed and delivered in presence of

WM. A. GILBERT, JR. GEO. H. PRESTON to J. R. F. and C. F. EMMA S. FAULKNER to C. F. WM. A. GILBERT, JR., to A. S. F.

Then, by deed about the same date, for this was really for the purpose of settling the rights between these parties, the 8th day of May, 1857, there is a deed to the Talbots, and back to James R. and Charles Faulkner, conveying back to him the lands upon which the mill stands, as described in the other deeds.

DEED.—C. P. TALBOT ET AL. TO J. R. FAULKNER ET AL., MAY 8, 1857.

Know all men by these presents, that we, Charles P. Talbot of Lowell, in the County of Middlesex and Commonwealth of Massachusetts, and Thomas Talbot of Billerica, in said county, merchants, in consideration of five thousand and five hundred dollars paid by James R. Faulkner of said Billerica, manufacturer, and

Charles Faulkner of Boston, in the County of Suffoik and Commonwealth aforesaid, merchant, the receipt whereof is hereby acknowledged, do hereby convey, remise, release and forever quitclaim unto the said James R. Faulkner and Charles Faulkner, in the proportions hereinafter set out, their heirs and assigns forever,

A certain piece or parcel of land, situated in the northerly part of said Billerica, with a brick factory and buildings thereon standing, bounded as follows, viz: Beginning at the road which passes in front of said factory, at the corner of said James R. Faulkner's house-lot, and running northerly on said Faulkner's land until it comes parallel with the front of his dwelling-house; thence westerly three hundred feet to a stake and stones; thence southerly one hundred and forty feet to a stake and stones at a little basin, so called, in Concord river; thence easterly on the south side of said factory creek, and on land of Nathaniel Stearns now or formerly, to the road above mentioned; thence on said road to the bounds first mentioned.

Also a certain other lot of land, with a wooden factory thereon standing, situate nearly opposite the brick factory aforesaid, being the same premises conveyed to Francis Faulkner by Nathaniel Stearns and John Baldwin, guardians, by their deed bearing date on the twenty-ninth day of April, A. D. 1831, recorded in Middlesex Registry of Deeds, book 305, page 44 (to which deed reference is hereby made for a more particular description of said premises), but without the water-rights and privileges described and set forth in said deed.

Also a certain other lot of land, situated in the northerly part of Billerica aforesaid, near the bridge over Concord river, with the buildings thereon, called and known by the name of the "Blacksmith Forge and Iron Works," being the premises first described in the deed by which Alner Kneeland, guardian, conveyed the same to the said Francis Faulkner, bearing date on the twenty-fourth day of May, A. D. 1836, and recorded in Middlesex Registry of Deeds, book 353, page 514 (to which reference is hereby made for a more particular description of said premises), but without the water-rights and privileges contained, set forth and described in said deed.

Also a certain other parcel of land, situate in said Billerica, bounded and described as follows, viz.: Beginning at a stake on the road leading from Tewksbury to the Canal Mills (formerly so called), at the intersection of the line of said road and the strip of land in common on the easterly side of the Forge lot, so called; thence north $40\frac{1}{2}^{\circ}$ west four rods, one and a quarter links by said strip of common land; thence south 51° west seven rods and thirteen links to a stake; thence north $81\frac{2}{3}^{\circ}$ west six rods, twelve and a half links across the little basin, so called, to a stake at land owned by the heirs of the late Francis Faulkner; thence north $51\frac{1}{3}^{\circ}$ east by said Faulkner's heirs' land eleven rods and three links to a stake; thence north $73\frac{2}{3}^{\circ}$ east by said heirs' land two rods, thirteen and a half links to a stake; thence south 85° east by said heirs' land two rods and fourteen links to a stake; thence south 70° east by said heirs' land three rods and nine links to a stake; thence

south $26\frac{1}{4}^{\circ}$ east by said heirs' land three rods, fourteen and one-third links to a stake at said road; thence south $56\frac{1}{2}^{\circ}$ west by said road four rods and seven links to the point of beginning; containing about seventy-nine and a half square rods, reference to be had to a plan of said premises drawn by Sprake Livingston, dated the 16th of May, A. D. 1844.

Also all our interest in a small strip of land four feet wide, adjoining said last-described lot, and hitherto used as common land

by said grantors and grantees.

Also, whenever the water above our dam shall be above a point which is three-quarters of an inch below the top of the bolt which is fixed in a rock near the northeasterly shore of the pond above said dam, and which has hitherto been a water-mark between said grantors and grantees, the right at all times whilst the water so continues above said point, of drawing water not exceeding fiftyseven and three-tenths cubic feet per second through the canal or creek, so called, on the premises above described, subject, however, to the limitations, reservations, exceptions and provisions herein contained, but never to be used on more than two waterwheels, and for scouring and steam boilers, with the right of renewing said two wheels, or of substituting in their place two other water-wheels, but so as never to have in said premises but two water-wheels at the same time, with the right to close the gates at the head of said canal or creek when it may be necessary for the purposes of repairing any of the works on said premises, the said grantees, their heirs and assigns, forever to maintain and keep said canal, and the flumes and gates thereof, and the flumes and gates on said premises, and all their apparatus and works, and all parts of their premises, in such good and proper condition that the water from the stream above shall not unreasonably run to waste through the same, and also to shut their gates on said premises and suspend the drawing of water, as aforesaid, for any purpose at all times whenever the head of water above the dam aforesaid shall fall to the point aforesaid, which is three-quarters of an inch below the top of said bolt, and also to keep their gates closed and prevent the leakage and waste of water so far as can be reasonably done while the water above said dam remains at or below said point, except that while the water is below said point, said grantees, their heirs and assigns, may, while their water-wheels on the premises are stopped, use in an economical manner so much water as may be necessary for steam-boilers and scouring purposes for eight sets of flannel machinery.

And we, the said grantors, for ourselves and our heirs and assigns, hereby reserve the right to shut off the water from said premises, and the right to enter upon said premises, and close the gates therein, and shut off the water therefrom, as often as and whenever said grantees, their heirs and assigns, shall draw more than the fifty-seven and three-tenths cubic feet, as aforesaid, and also at all times whenever said grantees, their heirs and assigns, shall unreasonably permit the water to leak or run to waste through their premises, and to keep the same shut off until said grantees, their heirs and assigns, shall take proper measures to prevent the

drawing of more than fifty-seven and three-tenths cubic feet of water, as aforesaid, and to prevent such leaks and waste, and also as often as and whenever the water above said dam falls to the point aforesaid, and to keep said gates closed and the water shut off while the water remains at or below said point, provided said grantees, their heirs and assigns, shall fail at any such times to

close, and keep closed, their gates on said premises.

And we, the said grantors, for ourselves our heirs and assigns, hereby except and reserve the ownership and control of the gates at the head of the canal leading to said premises, and the structures to which said gates are fixed, and the right to keep said gates and structures in order, and to replace them with others, and the right of access to them at all times, and the right to draw off the water of the river from the pond above our dam whenever and as often as and so long as it may be necessary to make changes, alterations, additions or repairs of our dam, or of any of our works on our premises, and the right to maintain our dam and flashboards, and to pass and repass to the same and around the mill-pond for all necessary repairs to our dam, or any part of our premises, and the right to convey materials for such repairs over the premises herein conveyed, whenever it may become necessary so to do.

And we, the said grantors, for ourselves and our heirs and assigns, hereby reserve the right of using the water of the mill-pond in any quantity, and for any and all purposes in a proper and economical manner at all times when the water in the pond is above the top of said bolt, it being understood that whenever the water in the pond is above the top of said bolt, and while it so remains above, the said grantors, their heirs and assigns, and the said grantees, their heirs and assigns, may exercise their respective rights in using the water of said pond at the same time, and that while the water in the pond remains above the top of said bolt, the use of the water of said pond by said grantors, their heirs and assigns, and by the said grantees, their heirs and assigns, within their respective limits herein set out, shall not be deemed an inter-

ference with each other's rights to use the water.

Whenever the water above said dam shall fall below the top of said bolt, and at all times while it remains below the top of said bolt, the said grantors, for themselves, their heirs and assigns, still reserve the right to use the water of said pond, but are to limit the water which they use while the water remains below the top of said bolt, to the amount and quantity which would run through the gates at the Canal mills as they existed July 20th, 1833, and June 10th, 1834, when measured by George O. Wilson, whose said measurement is to determine their size, situation and capacity, and under the head indicated in said measurement (the same being fixed by the deposition of said Wilson, taken in perpetuam, and recorded in Middlesex County Registry of Deeds, now Southern District, book of depositions, etc., No. 18, page 531, etc., to which reference is made), the amount and quantity of water to be fixed thereby, but not the size, situation or capacity of our gates.

And it is hereby understood that the grantors, their heirs and assigns, do not covenant or warranty and shall not be bound to

keep the dam any higher than they are legally entitled to keep it, without incurring any liabilities to any person for flowage, and that they shall in no way be bound to incur such liabilities.

And it is further expressly understood and agreed by and between said grantors, their heirs and assigns, and said grantees, and their heirs and assigns, that said bolt determines and fixes the top of said dam as the same at present exists, and that in case said dam shall hereafter, for any cause, be lowered or cut down, all the provisions of this deed now applicable to said bolt are to be taken and considered as applicable to and be in fact applied to the actual top of said dam as the same shall then be fixed and exist, and not to said bolt.

To have and to hold the same, with the privileges and appurtenances to the same, belonging in the following proportions: Two undivided third parts thereof to the said James R. Faulkner, and the other undivided third part thereof to said Charles Faulkner, their heirs and assigns, to their use and behoof forever; and we, the said Charles P. Talbot and Thomas Talbot, for ourselves and our heirs, executors and administrators, do covenant with the said James R. and Charles Faulkner, their heirs and assigns, that the premises are free from all incumbrances made or suffered by us, except as aforesaid, and that we will, and our heirs, executors and administrators shall, warrant and defend the same to the said James R. and Charles Faulkner, their heirs and assigns, forever against the lawful claims and demands of all persons claiming by, through or under us (except as aforesaid), but against none other.

In witness whereof, we, the said Charles P. Talbot and Thomas Talbot, together with Harriet E., wife of said Charles P., and Isabella W., wife of said Thomas, in token of their release of all right and title of or to dower in the granted premises have hereunto set our hands and seals this eighth day of May, in the year

eighteen hundred and fifty-seven.

The word "hereby" interlined in 36th line, 2d page, before signed.

C. P. TALBOT, H. E. TALBOT, THOS. TALBOT, ISABELLA W. TALBOT.

A. N. Brówn to C. P. and T. Talbot.

F. M. TALBOT to W. E. TALBOT.

W. A. LAMB to I. W. T.

Commonwealth of Massachusetts, Middlesex, ss., May 5th, 1857. Then personally appeared the above-named C. P. Talbot and Thomas Talbot, and acknowledged the above instrument, by them subscribed, to be their free act and deed.

Before me, A. R. BROWN,

Justice of the Peace.

The grants to Mears and Faulkner were all conveyed to Faulkner and Talbot, prior to 1857, subject to prior grants to Francis Faulkner and Mears.

By this conveyance back, they having got the whole of this property, the water-rights and land, they convey back in terms of said deed. When it gets below the point specified, the Talbots are only to use what water can pass through certain gates, which is testified to in a deposition in perpetuá.

Mr. Somerby then read the following deposition:—

DEPOSITION OF GEORGE O. WILSON.

First Interrogatory. (By Thos. Hopkinson, Att'y for C. P. Talbot.) Are you acquainted with the mills at Billerica, owned by the Middlesex Canal, and by Mr. Charles P. Talbot? [This interrogatory objected to by Middlesex Canal, as not being within the terms of the written statement, or of the notice.]

Answer. I am.

2d Int. Have you ever worked on the dam or gates or mill of the Middlesex Canal? If yea, when? [Objected to as before, and especially as to so much as relates to the gates or mill of the Middlesex Canal.]

Ans. I have worked on the gates and flume. I built pretty much all the gates, and flume, that now stand — but the dam I did

not work upon. At various times from 1833 to 1840.

3d Int. What did you do on the gates and mills of the Middlesex Canal in 1833? [Objected to, on same grounds as to 2d int.]

Ans. I took away the old mills, and built the new mill — gates, flumes, and wheels. I made all the new gates myself, under the orders of Col. Butterfield, — and at that time measured the old grist-mill gates. This work was in the summer of 1833.

4th Int. What is the relation of the gates to the dam, — where, and how situate? [Objected to, as before, and as not specifying what

gates.

Ans. The gates are not a part of the dam, but on the end of the dam, about seventy-five or one hundred feet from it, or below it. There is a basin above the dam, and flumes leading out from it to the wheels. The dam was built before I went to Billerica. The gates are in the flumes and near the wheels.

5th Int. Where the water is taken out of the basin to run into the mill, at the point where the gates are, is there no dam? Describe the gates and the dam, or fixtures in which they are set.

Objected to as before.

Ans. There is a bulk-head, which is water-tight, and which might be called a dam, where the water is taken out. The gates are set in the flumes. In the new grist-mill there are eight gates and five water-wheels. Six of the gates are seven and a half feet below the top of the dam. The bottom of the gate is one foot lower than the bottom of the flume. There are two flumes. The other two gates are six and a half feet below the top of the dam.

6th Int. What was the size of the gates in the old grist-mills

that you took out? [Objected to, as before.]

Ans. In the upper mill, the gates were one of them thirteen and

a quarter inches by sixteen. Another gate, fifteen by sixteen and a quarter inches. In the lower mill, sixteen and a half by eighteen and a quarter, — another gate, fifteen by fourteen and a half. I am not quite certain as to the second gate in the upper mill, whether it was sixteen and a quarter inches, or sixteen and a half.

7th Int. How many rnn of stones in the old grist-mills?

Ans. Two.

8th Int. How many in the new grist-mill?

Ans. Three.

9th Int. From the appearance of the gates which you took out, how long do you think they had been in? Describe their appearance as to age. [Objected to.]

Ans. One set of them I should think had been in twelve years or more,—at the lower mill. The upper mill-gates I should think

not more than six or eight years.

10th Int. What the dimensions of the new gates? [Objected to.] Ans. Three of the new gates are sixteen inches square. Three of them are fourteen inches by sixteen,—one fourteen inches square—and one nine inches by ten.

11th Int. Which gates, the old or new, were under the greatest head of water, and what is the difference, if any? [Objected to as

before.]

Ans. The new gates are under the greatest head of water. The difference is what I call two feet, but it is not exactly two feet. The new grist-mill draws 1440 square inches of water under a seven and a half feet head, at the six gates,—and 286 square inches under a six and a half feet head, at the other two gates. My survey is two feet difference between the old and new grist-mills, as to head of water. The old grist-mill gates were five and a half feet below the top of the dam, measuring to the bottom of the gates. The four gates of the old grist-mills drew 974 square inches.

12th Int. Did you put a new wheel into the mill now occupied for making carpets, and formerly as a dye wood mill? If yea, what is the size of the gates in this new wheel?

Ans. Yes. There are nine gates there, and it is a breast-wheel. The water varies on that wheel. I calculate it as thirty-two cubic

feet per second.

13th Int. Are you a millwright, and how long have you been engaged in that business?

Ans. I am. It is twenty years since I first begun, and have ever since followed it.

14th Int. What number of inches at the tub-wheel gates would draw a quantity of water equal to that used to carry said breast-wheel?

Ans. Thirty-two cubic feet of water per second is nearly the same in quantity as water from a gate twelve inches square under a head of eight feet.

1st Cross-Int. (By Tappan Wentworth, counsel for Proprietors of Middlesex Canal.) In 1833, or previous thereto, was water used to carry any machinery in the old grist-milla, except the two

runs of stones stated in your answer to seventh interrogatory? If

yea, what?

Ans. I suppose there was. There were other wheels there, but not for turning the grist or saw mill. There was a plaster-mill to pound plaster in the old mill. There was an oakum-mill, also. There was one wheel to carry both of those. I never saw the oakum-mill going.

2d Cross-Int. Had this wheel separate gates from those used for carrying water to corn-mill wheel? If yea, how many and of what

size, if you measured them?

Ans. That wheel had one gate, sixteen inches by eighteen, sep-

arate from the other wheel. I measured it.

3d Cross-Int. Was there a part of the grist-mill used for boring logs for aqueducts, previous to 1833? If yea, was there a separate gate through which water passed to the wheel carrying the boring machine? State the size of such gate, if there was one and if you measured one.

Ans. There was a part of the saw-mill, or a building attached to the saw-mill, for boring logs. There was a separate gate and a separate wheel for the boring machine. I did not measure the gate, but should think it was a foot square or more. The machine was not used after I went there, and I never saw it used at all. There was a lath-machine there, that run by another wheel, and took a few inches of water. It had a small breast-wheel, with a gate thirty inches by three or five.

4th Cross-Int. Was there not a draw-up gate in the old saw-mill in 1833, or previous? If yea, what was its size? State if you

measured it.

Ans. There was such a gate, thirty-six inches by eight, by my measurement.

5th Cross-Int. Was there a separate gate to pass water to a wheel used for a bolting-mill, in said grist-mill previous to 1833?

Ans. I never saw any such gate. There was an old bolting-mill, but I saw no wheel or gate when I went there, or since.

6th Cross-Int. Was there not more than one gate to the boring-mill? If so, how many?

Ans. I never saw but one gate there to the boring-mill, that I know of.

7th Cross-Int. Were the four gates you measured in the old grist-mill the gates that fed the corn-mill wheels exclusively?

Ans. They were.

8th Cross-Int. When did you measure the old gates? At whose request did you do it? Who was present at the time? Was any notice given to the proprietors of Middlesex Canal, or Mr. Eddy, of this measurement? Did you at the same time, or at any other time, measure any other old gates taking water from the basin? If so, at whose request? Who was present? Was notice given to said proprietors, or to Mr. Eddy, of the same, and what were the dimensions of such other gates measured by you?

Ans. I measured the old gates July 20th, 1833, at the request of Francis Faulkner, Esq. Col. Butterfield, Faulkner, and myself only were present. I know nothing about any notice to the canal.

or to Mr. Eddy. I, on same day, measured another old gate taking water from the basin to the plaster-mill, or oakum-mill. This was the measurement of the grist-mill. The next year the saw-mill was fixed, and then I measured the saw-mill gates which lead out of the same basin. I measured the saw-mill gates for my own fancy, and no one was present with me; and the fact was so as to the measurement of the plaster-mill gate. I have no knowledge of any notice to the canal, or to Mr. Eddy. Two of the saw-mill gates were twelve by fourteen inches; one gate seventy-two inches by five; and one seventy-one inches by five; and one (which was a draw-up gate) eight inches by thirty-six.

9th Cross-Int. How do you recollect the exact dimensions of

these gates?

Ans. I marked it down at the time, — saw-mill, June 10, 1834,—the grist-mill, July 20, 1833. I marked it on a memorandum, which I have here on a paper. —

10th Cross-Int. Will you allow that paper to be annexed to the

deposition?

Ans. I consider that paper as my property. The canal company have a copy of my measurement of the old grist-mill and saw-mill. I gave Mr. Eddy a copy, within a month past, of the grist-mill and saw-mill measurement.

11th Cross-Int. Where has the memorandum you speak of remained since 1833 — and are your measurements on the same piece of paper?

Ans. It has been in my own possession, among my papers. The

measurements are not on the same paper.

12th Cross-Int. In your reference to memoranda to-day, do you use the originals or copies?

Ans. I use the original.

13th Cross-Int. Do you know the number and size of the gates that were in use at the grist and saw-mills, and the buildings connected therewith in the months of May, 1825, and March, 1826. If yea, state distinctly all that you know on the subject?

Ans. I know nothing as to that, and had not then seen them.

I saw them in 1831; November or October for the first time.

14th Cross-Int. How high is it necessary to raise the present

grist-mill gates, to carry the stones for grinding?

Ans. They are generally used about as I have given them. The gates usually work as I have given them. You can grind with one gate, but you cannot grind much corn. The gates were made to work according to the dimensions I have mentioned; but they will grind with less, and it is necessary to twist them full up, to do good business, to the dimensions I have given.

15th Cross-Int. Do you know how high the gates are usually

hoisted to grind grain?

Ans. Usually to the height I have stated, but they can be raised two inches higher. My dimensions include the ordinary working aperture of the gates, but they can be raised two inches higher.

16th Cross-Int. Do the present tenants hoist more than one gate

to grind wheat or corn to your knowledge?

Ans. Sometimes they hoist one and sometime two, I suppose.

I don't know how much water they take in grinding wheat. A year ago last fall they did. When the water was very low, I have known them use one only.

Additional-Int. (By T. Hopkinson, Cousel for C. P. Talbot.) Were the grist-mill, saw-mill, oakum and plaster-mills ever worked

all at the same time?

Ans. That is more than I know. It was very common for the grist-mill and saw-mill to go at the same time. I never saw the oakum-mill at work.

2d addal-Int. How long was the plaster-mill worked to your

knowledge?

Ans. Never any work was done with it, that I know of, — but I

have seen it going, though there was no plaster to grind.

3d addal-Int. How long was the lathe machine worked. Do you know that this was ever worked at the same time, with both the grist and saw-mill?

Ans. It was torn down in 1832, or thereabouts, — that is the year that they took the mill down. It was going, when I first went there, in 1831. They were all worked at the same time.

4th addal-Int. Are the same mill-gates now of the same dimensions they were in 1838? Have they been changed since you

knew it.

Ans. There is only one saw-mill now, and there were two them. There are four gates now, and then there were five. The gates now are the following: — one saw-mill gate, seventy-two inches by five; one nigger gate, twelve by fourteen; a draw-up gate, fourteen by fifteen inches; and another for the grindstone, now used by for the carpet-factory, sixteen by eighteen inches; but I suppose it is used now about half open. The grindstone did not take so much, and the circular saw probably took more.

5th addal-Int. Will you annex to this deposition, a copy of the

paper on which yau set down your measurements?

Ans. I offer copies, which are annexed.

GEORGE O. WILSON.

COMMONWEALTH OF MASSACHUSETTT.

Middlesex, ss.

On this thirtieth day of August, in the year of our Lord eighteen hundred and forty-five, personally appeared before us the subscribers, Justices of the Peace, within, and for said county, and counsellors at law, George O. Wilson, the aforesaid deponent, and being duly sworn to testify the truth, the whole truth, and nothing but the truth, he gave the foregoing deposition, by him subscribed in our presence, and the same was by one of us reduced to writing. Taken at the request of C. P. Talbot, to be used in perpetual remembrance of the thing. And it being suggested to us by said Talbot, in the written statement of his claim and interest, in the subject matter (which statement is herewith returned,) that the proprietors of the Middlesex Canal were interested therein; we caused notice to be given in due form to said proprietors of the time and place for taking said deposition, and they attended at said time and place, by Caleb Eddy and Tappen Wentworth, Esq.,

and said proprietors objected to the taking thereof; but it appearing to us that the deponent expected to leave this part of the country, in the autumn for Georgia; there to follow his trade of a millwright, provided, he found it for his interest so to do, or in any other part of the country, where he should find employment, — that he is an unmarried man, having a mother resident at Billerica, in this county, — and that he is not certain where his residence may be for the future; we decided to take said deposition.

Fees, including stationary, use of room, etc., \$8.

SETH AMES, DANIEL S. RICHARDSON.

Middlesex, ss. November 28, 1845. Received and recorded in the Registry of Deeds, Book of Depositions, etc., No. 18, Page 531, etc.

Attest, CALEB HAYDEN,

Register.

THOMAS TALBOT, sworn.

- Q. (By Mr. Abbott.) You are one of the parties named here, Governor, I believe?
 - A. Yes, sir.
 - Q. When did you first go to Billerica, to the mills?
 - A. In 1839.
 - Q. And been there ever since?
 - A. Yes, sir.
- Q. Connected with the water-power during the whole of that time?
 - A. Yes, sir.
 - Q. The first purchase, as you see by the deed, was 1844?
 - A. In 1844.
 - Q. And your next purchase in 1851?
 - A. Yes, sir.
 - Q. (By Mr. Butler.) Tenant up to the first purchase?
 - A. Yes, sir.
- Q. (By Mr. Abbott.) Except to this purchase you made in 1844?
 - A. Yes, sir.
- Q. And subsequently, between 1844 and 1851, you hired of the Middlesex Canal?
 - A. Previous to 1844.
 - Q. Didn't you hire something after 1844?
 - A. No, sir.
- Q. And since 1851 you have been in possession and using and occupying it?
 - A. Yes, sir.
 - Q. Using the water for your own purposes?
 - A. Yes, sir.
 - Q. The canal was discontinued about what time?
 - A. In the fall of 1851.

Q. There was no water drawn after 1851?

A. I believe not, sir.

- Q. And absolutely filled up about that time below?
- A. I think it was filled up in 1852, or '53; I am not sure.
- Q. You paid taxes during all this time on this property?

A. Yes, sir; I think so.

- Q. And something has been said here in reference to the land on the east side, I suppose it is — at any rate, it is the side towards Boston, at the end of the dam. Does your land come up to that end of the dam?
- A. I don't know that we have a descriptive deed of that end of the land.
 - Q. Excepting the Thomas Richardson deed?

A. Yes, sir.

Q. Whether that dam is the one which you have always used and occupied since you have been there?

A. Yes, sir.

Q. Anybody else claim any right in it except yourself?

A. No, sir.

Q. How large an investment have you? I don't mean in anything but the land, buildings and machinery.

A. You mean our entire investment?

Q. Yes. In the Billerica mills, including land, machinery and the buildings used in connection with your water-power there.

A. Our expenditure there is about \$400,000.

Q. And your other capital connected with it to carry it on?

A. Should think about \$300,000.

Q. About \$700,000?

A. Yes, sir; approximately.

Q. And you have got it as nearly as you can by looking over your books, I suppose?

A. Yes, sir.

Q. When was your flannel mill built?

A. First in 1857, and in '70.

Q. It was enlarged in 1870?

A. Yes, sir.

Q. How large was it first built in 1857?

A. Eight sets.
Q. In 1870, enlarged to what capacity? A. Built it for twenty sets and put in six.

Q. Making fourteen?

A. Yes, sir.

Q. You have full room, as I understand you, for twenty sets?

A. Yes, sir.

Q. How many wheels to that mill? A. Two.

Q. Two hundred horse-power? A. We aimed at about 200 horse-power when we put them in.

Q. That is the capacity for the twenty sets?

A. Yes, sir.

Q. What wheels are they there?

A. One is the Boyden turbine, built in Fall River; and the other is a Swaine wheel.

Q. Whether the wheels are expensive and as good as you could get, or not?

A. We intended they should be the very best, put in the best

shape.

Q. How much did they cost you there?

- A. The Swaine wheel cost us between \$11,000 and \$12,000; the Fall River turbine cost us, without remembering positively, between \$5,000 and \$6,000.
 - Q. And fitted up as well as you could have them made?

A. Yes, sir.

Q. What is your head of water?

A. Eleven feet.

- Q. How many other wheels have you besides these two in the brick mill?
 - A. We have six wheels in the dyewood mill.

Q. Are these turbines?

- A. Four Fall River turbines, one Blake and one Whitney.
- Q. I want to ask you if you gave the outlets of those wheels to Mr. Holmes?
- A. I gave him the outlets of the Fall River turbine wheels, and the Swaine wheel I got the outlets from the builders as they gave them to me. I didn't have them measured.

Q. As they gave them to you as they were put in?

A. Yes, sir.

Q. Well, the Blake & Whitney wheel.

- A. I gave Mr. Holmes the size of them. That is all I know about the outlets.
 - Q. When they were put in there? A. Yes, sir.

Q. So that you have eight wheels in all?

A. Yes, sir.

Q. Have those wheels all been put in since you have been there?

A. Yes, sir.

Q. And how old is any one of them?

A. Some of the turbine wheels were put in in 1853 or '54 I should think — some of the Boyden turbine wheels.

Q. (By Mr. Butler.) In the dye-works?

A. In the dye-works.

- Q. (By Mr. Abbott.) In good condition at the present time?
- A. They are running, as long as they have been there, in fair condition.
 - Q. How about the dam, whether it is permanent or otherwise?

A. That is permanent.

Q. In reference to your water-power appliances necessary for keeping up the head and fall of your dams and other appliances; whether it is considerable expense to keep it going from year to year?

A. Only a reasonable expense, keeping the flash-boards on; it

is not very large.

Q. I want, Governor, to know what expense it would be yearly, for keeping that part constant. I mean keeping the dam up, keeping the flash-boards up so to afford you water, for the sluiceways and canals, whatever they are?

A. I should think only a few hundred dollars a year for keeping it up.

Q. It is a regular split-stone dam?

A. Yes, sir.

Q. Did you ever have any trouble with that?

- A. It leaks once in a while and we tighten it; it is a good substantial dam.
- Q. In reference to using any means of water, which you have there, by the old Middlesex Canal in reaching out towards Lowell, and the Merrimac river, whether you have the means of using any of the water which you caught?

A. Plenty of room.

Q. And so directly into the river below?

- A. Yes, sir; the canal is built partially; the old canal is still there, and they raised the bank part of the way.
- Q. So that you have plenty of room to put in more works, and take the water directly from the canal into the river?

A. Yes, sir.
Q. Take it during the dry season; say the four dry months beginning with June and ending with September, inclusive, how has it been heretofore in reference to the running of your brick mills and your other mills?

A. My woollen mill?

Q. Your woollen mill; I call it a brick mill. I believe that is

the only brick mill you have.

- A. We have a dyewood mill of brick. We have never but two occasions that I can call to mind been troubled for want of water. I mean running the woollen mill.
 - Q. When were those two occasions?
 - A. One was a year ago last winter.
 - Q. That is, the winter of 1875?
 - A. I think so; and this summer, some since I returned home.

Q. That would be in September?

- A. Yes, sir.
- Q. Do you recollect what part of the winter of 1875 it was?

A. It was the latter part of the winter.

- Q. To what extent was that interference? I wish you would describe it as well as you can.
- A. I don't remember. We were troubled two or three weeks I should say, and were obliged to shut off one water-wheel, and tried to run with one.
- Q. You didn't stop your mills, but were troubled in finding water for a while?
 - A. Yes, sir.
 - Q. Not as much as you wanted?
 - A. No, sir.
 - Q. It didn't amount to enough to stop your works?
 - A. No, sir.
 - Q. Then this summer since you returned?
 - A. We have been obliged to shut off part of our machinery.
 - Q. In the woollen mill?
 - A. Yes, sir.

Q. You didn't stop the mill entirely?

A. No, sir.

Q. How long did that last?

A. From the second week — I should say in September, for two weeks; perhaps two or three weeks, until the rain came, some two or three weeks ago; about two weeks, I should think.

Q. Now those two exceptions, you say, are the only things you now recollect of being interfered with in your woollen mill. With those two exceptions have you managed heretofore to run your

works during the dry season?

- A. We first intend that our woollen mills should be kept in full operation and not interfered with, and then we take the water, when the quantity is more than the woollen mill needs, and use it for our dyewood mill purposes. When the water commences to fail us, we stop portions of the dyewood mill, keeping the woollen mill running.
- Q. Now just at that point I want to ask you how frequently, or otherwise, is it during these four months that I have spoken of, the dry season, that you are obliged to stop the whole of your dyewood machinery, all day?

A. Well, we sometimes have to stop the larger or some considerable portion of the dyewood mill in the daytime, in the dry-

est portion of the season.

Q. How large a part of the time, if there is any time, when you have absolutely to stop the whole day the dyewood machinery? I am speaking of the working-day.

A. We have to stop occasionally; but the water must be very

low for that; we haven't had to stop very much.

Q. Unfrequently when you have to stop every part?

A. Frequently we do. Q. Frequently you do?

A. Yes, sir.

Q. How large a part? I mean now the working-day.

A. Sometimes we run part of the day, and sometimes we have to stop all day, but we can generally run some portion of a day.

Q. That is what I want to get at. So that the stopping of your

dyewood machinery all day is quite unfrequent to you?

A. Yes, sir.

Q. But sometimes it happens that you run part of the day, and

then have to stop it?

A. Yes, sir. We do occasionally have to stop our dyewood mills. We do stop our dyewood mills entirely in the daytime and put them on nights.

Q. Then, in reference to running nights your dyewood machinery, how do you manage about keeping up your head of water for the

next morning?

A. Well, when the factory stops we put on such machinery in the mills as we can run, and have the pond full in the morning.

Q. So you don't run your dyewood machinery at nights so as to impair your head of water in the morning?

A. That is not our intention.

Q. Now, in reference to Mr. Faulkner's mill, how large a part

of the time should you think, during, say, ten or twelve years past, he was obliged to stop by getting down to that limit, "three-

quarters of an inch below the bolt"?

A. Well, it is a mere matter of judgment, because I have no record whatever, but I should think somewhere from thirty-five to forty-five days, I should say for some time until latterly; the last two or three years longer.

Q. Do you recall it, sir, of his stopping in the winter at any

time, except in this same time which you speak of?

A. No, sir.

Q. Whether, in the winter of 1875, a year ago last winter, he was obliged to stop?

A. Yes, sir.

Q. And during that time which you speak of as interfering with your machinery?

A. Yes, sir.

Q. You are pretty familiar with the run of the water of that stream, are you not? I mean at your mills.

A. Well, somewhat, sir.

Q. And since you have been there have tried, from your investment and interest in it, have watched it pretty closely, I suppose?

A. Yes, sir.

Q. I want to have you give us an opinion, as far as you can, from your observation of the water. Take this case: take away a fifth of the water during the six months beginning with May and ending with October, May and October inclusive, how would it operate upon your dam with reference to the water being kept down, you using the water at the same time, the water being kept down to "three-quarters of an inch below the bolt"?

A. I think it would affect us in the winter more than it has formerly. I think we should be short of water, probably, in the winter months, and I have an impression that as far as the surplus power is concerned, it would be narrowed down to about six

months.

Q. That is the surplus water, that above this bolt spoken of, three-quarters of an inch?

A. Yes, sir.

Q. Would not substantially exceed, so far as your observation is concerned, six months of the year?

A. I should think there was more danger of its being short in

six months of the year.

Q. Can you give us any idea, of your our knowledge, of the amount and extent of your water-wheels,—the capacity of your water-wheels?

A. I have had an idea about the power of the water-wheels

without having any positive measurement.

Q. Well, we have got pretty positive measurement; I will not press that. Your woollen mill, you said, was 200 horse-power, as you understood it?

A. That was my intention, to put in 200 horse-power.

Q. Whether you have any room in your present woollen mill to put in steam-power?

A. No, sir.

Q. And any application of steam-power would have to be in a separate building?

A. Yes, sir.

Q. And then for the accommodation of your coal, how would it affect the use of your mill and mill-yard?

A. If the boiler-house is put where it is suggested to be put?

Q. Well, take the best place to put it to use your mill?

A. Well, it would occupy pretty much all the coal room we

have got.

- Q. I want to call your attention to the application of steam power to your woollen mill; whether there is any trouble in the use of your lower story where you would apply it?
- A. The belt upon which it was suggested to apply it, where it was supposed would be the best possible place to supply it, comes

right through, and cuts off our basement.

- Q. What effect would that have practically on a portion of your mill?
- A. The belt comes right between our finishing and scouring room, and every bale of goods we finish would have to pass just where that belt would go, to reach our finishing room.

Q. What effect would that have in lessening the trouble and the

expense of carrying on your works?

A. It would be a very serious inconvenience. It is very diffi-

cult for me to estimate the damage.

Q. Well, sir, you have a pretty close knowledge of your mills, and the way they are worked and run. What, in your judgment, would be really the loss, as near as you can put it, to be compelled to submit to that in the management of your mill, as it is now?

A. As far as I understood the application of steam, — as is supposed to be the best way of applying it, — I would not have it there

for \$10,000.

Q. From this inconvenience of cutting up this one part from another in the basement story you would have to provide another method of going?

A. Yes, sir.

Q. Have you weighed that, and thought of it, and looked at it as carefully as you could?

A. I have, sir.

- Q. What is now the price of coal upon your premises, delivered at the yard?
 - A. I think it cost about \$7 a ton delivered at our coal-pit.

Q. Well, 2,000 or 2,200?

A. A gross ton; the best coal.

Q. It would be \$6.50 upon the railroads; then you would have to get it from the railroad to your pit?

A. It might be a shade different from \$7, but I think it would not be far from \$7. I think about \$7.

Q. What has it been heretofore?

A. From \$8 to \$9.

Q. Not below \$8.

A. I am not sure.

Q. I mean in the last ten or twelve years?

A. It has been a great deal higher than that in the last ten or twelve years. I am not positive what we paid for coal the last year. I have not looked.

Mr. Abbott. A claim was made in the Essex Company's case, that there was no attempt made to settle. Do you make a point

of it here?

Mr. Butler. I think you had better put in your case.

Q. (By Mr. Abbott.) What was the condition of the mills and the buildings, sir at the time you purchased them in 1851?

- A. The main mills of the Canal Corporation were burnt off in 1846 or '47, I think it was, and they only rebuilt one saw-mill, and at one end of it they put in a small grist-mill to comply with the condition of the town.
 - Q. One set of stone?
 - A. Yes, sir; and one mill.
 - Q. How was it as to its being a costly mill or otherwise?
- A. It was not a costly mill. We practically bought the dam and water-power.
- Q. That is, for your purpose, the dam and water-power were all that were available?
 - A. Yes, sir.
 - Q. And how was it as to the dwelling-houses?
 - A. There was but one dwelling-house and four tenements.
 - Q. An old or a new one?
 - A. An old one; it is a very good one.
 - Q. Built how long?
 - A. I don't remember; it was built before I came there.

[Adjourned to Tuesday, October 3d, at 9.30.]

TUESDAY, Oct. 3d.

TESTIMONY OF HON. THOMAS TALBOT. - Continued.

- Q. (By Mr. Abbott.) Your Stern's purchase was on the east side of the river where the old saw-mill was which was spoken of?
 - A. Yes, sir.
 - Q. Part of Mr. Faulkner's mill now stands on that land?
 - A. Yes, sir.

Cross-examination.

- Q. (By Mr. Butler.) Who owns the land where the easterly end of the dam stands?
- A. We own the dam, and all the land rights conveyed to us by the deed of the Middlesex Canal Co.
- Q. Have you any other right to the dam than that conveyed by the Middlesex Canal Co.?
 - A. No, sir, except by possession.
- Q. You have no deed, then, from anybody else of any land on the east side of the river except the Middlesex Canal Co.?
- A. We have had all the land on the east side of the river deeded to us by the Faulkners.
 - Q. And then you deeded it back?
 A. We conveyed to them; yes.
 - Q. So that you now own the land on the east side of the river?
- A. The Middlesex Canal Co. gave us the right-of-way around that dam, and the right to have access to it at all times on that side of the river through their land, and the right-of-way around it, if I remember correctly, for the purpose of maintaining the dam, repairs, and every proper purpose, if I remember correctly. I have not read the conditions.
 - Q. The deed will show for itself?
 - A. Yes, sir.
 - Q. But to the land, except the right-of-way to maintain the
- dam, you got no deed?
- A. Only what we got from the Middlesex Canal Co., and the Messrs. Faulkner, and the Sterns' deed. We had a deed from the Messrs. Sterns. How that affects the question, I am now not informed.
- Mr. BUTLER. We will put in the deed of Nathaniel Sterns to you, dated June 22d, 1844.

Know all Men by these Presents, That I, Nathaniel Sterns, of Billerica, in the County of Middlesex and Commonwealth of Massachusetts, yeoman, in consideration of twenty-six hundred and seventy-seven and fifty one-hundredths dollars to me paid by Charles P. Talbot, of said Billerica, trader, the receipt whereof I do hereby acknowledge, have granted, remised, released and for-

ever quit-claimed, and do for myself and my heirs, by these presents, remise, release, and forever quit-claim unto the said Charles P. Talbot, his heirs and assigns, a certain parcel of Real Estate, situate in said Billerica, at the Canal Mills, so called, being the saw-mill and water-privilege, lately belonging to the heirs of Nathaniel Mears, dec'd, with all the machinery and saw-mill apparatus to the same belonging, bounded as follows, viz.: Beginning at a stake on the road leading from Tewksbury to the Canal Mills, at the intersection of the line of said road and a strip of land in common, on the easterly side of the Forge, so called, thence north 40½° W., four rods one and a quarter links, by said strip of common land; thence south 51° west, seven rods and thirteen links to a stake; thence north 812° west, six rods twelve and a half links across the Little Basin, so called, to a stake at land owned by the heirs of the late Francis Faulkner, Esq., dec'd; thence north 51¹° east, by said Faulkner's heirs' land, eleven rods and three links to a stake; thence north 732° east, by said heirs' land, two rods thirteen and a half links to a stake; thence south, 85° east, by said heirs' land, two rods and fourteen links to a stake; thence south 70° east, by said heirs' land, three rods and nine links to a stake; thence south 261° east, by said heirs' land, three rods fourteen and one-third links to a stake at said road; thence south 56½° west, by said road, four rods and seven links to the point begun at, containing seventy-nine and a half square rods, reference to be had to a plan of said premises, drawn by Sprake Livingstone, dated the 16th day of May, 1844, together with all the rights and privileges and water-power appertaining to said mill, now owned by me, or owned and possessed by me on the thirteenth day of May last, hereby intending to convey all the real estate I own on the east side of Concord River, in Billerica aforesaid, as privileges and appurtenances, to said mill, to have and to hold the afore-mentioned premises, with all the privileges and appurtenances thereunto belonging to him, the said Charles P. Talbot, his heirs and assigns, forever; so that neither I, the said Nathaniel Sterns, nor my heirs, or any other person or persons claiming from or under me or them, or in the name, right or stead of me or them, shall or will, by any way or means, have, claim or demand any right or title to the aforesaid premises, or their appurtenances, or to any part or parcel thereof forever. I, for myself and my heirs, executors and administrators, do covenant with said Charles P. Talbot, his heirs and assigns, that I will, and my heirs, executors and administrators shall, warrant and defend the same to the said Charles P. Talbot, his heirs and assigns, forever, against the lawful claims and demands of all persons, claiming by, through, or under me, and against no other claims and demands.

In witness whereof, I, the said Nathaniel Sterns, together with Sarah Sterns, wife of said Nathaniel Sterns, in token that she releases all claim to dower in the premises, have hereunto set our

hands and seals, this twenty-second day of June, in the year one thousand eight hundred and forty-four.

> NATHANIEL STERNS, L.S. SARAH STERNS, L.s.

Signed, sealed and delivered in presence of us,

EMELY STERNS, MARSHALL PRESTON.

COMMONWEALTH OF MASSACHUSETTS.

MIDDLESEX, SS.

June 26th, 1844.

Then the above-named Nathaniel Sterns acknowledged the above instrument to be his free act and deed, - before me.

MARSHALL PRESTON.

Justice of the Peace.

MIDDLESEX, SS.

June 27th, 1844.

Rec'd and recorded in the Registry of Deeds, Book 445, Page 237.

Attest:

WM. F. STONE, Reg.

Q. The Middlesex Canal was running when you came there, Gov. Talbot, was it not?

A. Yes, sir. Q. Whether in the dry season they run their saw-mill?

A. Well, largely they did. Mr. Wilson had a saw-mill, and had a right to run it; but the canal corporation had a right to close all those mills, except the town grinding.

Q. I am not talking about rights, I am asking about the fact.

Did they run their saw-mill in the dry seasons?

A. Not in the lowest time, when the water was low.

Q. Wasn't the canal corporation frequently short of water to

operate their canal with in the dry season?

A. Sometimes they were; when the grist-mill was rising considerable water, they would be short; although, as a rule, my impression is that when the mills were not running, there was enough for the canal.

Q. Did they take any means to clear out the ford-way above the dam, in order to get a larger supply of water?

A. I have heard of such a thing; but I never saw it done. That

was before I came, I think.

Mr. Abbott. We are willing to admit, if you want that fact in, that some time, very soon after they commenced, they undertook to blast out the ford-way, for the purpose of getting more water.

WITNESS. That was not within my knowledge.

Mr. Butler. I had reference more particularly to clearing out the weeds.

Mr. Abbott. They undertook to blast out the rocks. That is

still stronger.

Q. Whether in the dry season, the Middlesex Canal did not use most of the water?

A. They did.

- Q. How far does your dam, as a dam, in your judgment, flow back?
- A. Well, I suppose the effect of it is seen above Barrett's Bar, at Concord. I don't remember now how much. I have not recently noticed.

Q. About how much there?

- A. Well, I don't remember. Perhaps two or three inches.
- Q. It it correctly stated in the report of the Commissioners, Mr. Storrow and others?

A. As far as I know, it is.

- Q. You had experiments made at one time on your dam, did you not?
 - A. Yes, sir. You mean, under our direction? Q. Under the direction of the Commissioners?
 - A. The Commissioners had experiments made. Yes, sir.

Q. You saw the effect of those experiments?

A. Yes, sir.

Q. How much did they take down your dam?

A. The lowest was fifty-seven inches, I think. That is, exhausted the water to that extent, I think.

Q. For how long did they affect it to that extent?

A. I cannot tell you; not long; a day or two, perhaps. Q. Long enough to observe its effect upon the pond above?

A. I have no doubt of it.

Q. How much did it lower the water of the ford way?

- A. A little less than eight inches, I think. I am not quite sure.
 - Q. It is stated in the report of the Commissioners, is it not?

A. I think it is.

Q. And stated correctly, as you remember it?

- A. As far as I know. All this is from recollection, I have not examined that report for a long time.
- Q. But you remember, undoubtedly, whether at the time it was correctly stated, as you understood it?

- A. I presume it is correct, sir.
 Q. Then, as far as you understand it, the taking down of your dam fifty-seven inches would not lower the water at the ford-way more than eight inches. In other words, you could not draw more than eight inches of water above the ford-way by drawing off your dam?
 - A. That is, as I understand it.

Q. How large in extent is this ford-way?

A. Well, I don't know. I should think it extended up and down the river from two to four hundred feet. I could not say.

Q. Have you ever had any soundings made to see what extent of blasting would take out say two or four feet?

A. No, sir.

Q. Have you any opinion upon that subject?

A. I have never examined it with a view of doing that. I don't know that I have any judgment about it.

Q. How deep was the water on Barrett's Bar, near Concord,

when it affected it there slightly?

A. I don't remember; but there is a channel there. In the deepest part of the channel, I don't know, but I should think it was, perhaps, two feet deep, possibly.

Q. How much fall is there in the river between the top of your

dam and the Causeway bridge at Sudbury?

A. That depends upon the stage of the river.

Q. I mean when the river is even full.

- A. It varies from two and a half feet to four, depending upon the state of the river. I have seen surveys where it has been stated at that.
 - Q. You have had surveys made, have you not?

A. We did once.

Q. Have you got a copy of that survey?

- A. It is in the report of the committee upon the flowage of meadows on Concord and Sudbury rivers, which Mr. Abbott had yesterday. Mr. Avery made the survey. I do not give his fall. I don't remember what he made it.
- Q. What is the distance from your dam to the Sudbury causeway, where this fall is made?

A. Well, from twenty to twenty-two or three miles, I think.

Q. Now, in the dry season, when the water stands even with the top of the bolt, what is the fall from the top of the bolt at your dam to Sudbury causeway?

A. I should say about three feet.

Q. Wasn't it made up twenty-eight inches?

A. I saw it so stated. I think, if I remember right, that Mr. Avery made it about three feet.

Mr. Abbott. I think that survey is in the book. It was made

carefully.

Q. In using your dam, do you draw down the water at night to any considerable distance on the dam for the purpose of storing up water in the night?

A. We do.

Q. How much?

A. Well, from twelve to eighteen inches.

Q. Taking care to leave it full to commence work in the morning, I suppose?

A. That is the instruction.

Q. That is what you mean to do?

A. Yes, sir.

Q. If it is not used that way, it is against your wish and will?

A. It is.

Q. In the summer-time, in the last six years, how many sets of cards, with the requisite machinery, have you actually used?

A. We have run fourteen since the extension, in 1870 or '71; I think in '71. Since that time, we have run fourteen sets.

Q. And you reckon about seven horse-power per set?A. I think seven is not sufficient. I think ten is ample.

Q. Isn't it generally reckoned about seven?

A. No, sir, I think not. We used to think that seven would run a set of flannel machinery; but now that they have the addition of drying-machines for wool, drying-machines for cloth, burring, picking, and scouring by machinery, I do not think it will. Then the additional speed. We are running now much faster than we used to, which takes more power. I think ten is ample; but I should not want to put water-wheels of any power in less than ten horse-power to a set.

Q. Was the consideration mentioned in your deed from the

Middlesex Canal, the true consideration?

- A. Yes, sir.
- Q. \$20,000.
- A. Yes, sir.
- Q. Which takes the most power: your drug and dye-wood works, or your mill?

A. The dye-stuff works now.

Q. How many horse-power does your dye-stuff works take when they are all running?

A. Well, something rising two hundred horse; in in the neighborhood of two hundred horse; a little rising of that, I should say.

Q. Now, about your power below. Does the Wamesit dam, with its flash-boards, flow up to your mill?

A. It flows into our wheel-pits, sir. We sunk our pits low, and, no doubt, Wamesit dam flows into them.

Q. You feel sensibly any rise down there?

A. Yes, sir.

Mr. Abbott. I believe the relative rights of those dams are fixed by referees, of whom Mr. Francis was one?

Mr. Butler. Yes, sir.

Q. Take the feeders of the Concord river above your dam; what is the first one?

A. There is none of any importance that I remember of until we reach the Assabet. There is a small feeder in Billerica, running from Nutting's pond; there is a small stream comes in there, with a little machine-shop there, on the east side. Then there is one in Carlyle, a small brook.

Q. Where does that come from?

A. That I don't know; I never followed that; at least, I have not for a long time. I know there is a little brook comes in there.

Q. That is Black Brook. Then there comes in the Assabet, and that forms one branch of the Concord river.

A. Yes, sir.

Commissioner Russell. Where is Black Brook?

Mr. Butler. Black Brook comes in between Concord and Billerica, — the Assabet comes in in Concord.

Q. One branch of the Assabet is the brook that earries Wetherbee's mills in Acton, is it not?

A. Yes, sir.

Q. And that is fed by a reservoir known as Magog Pond, I think?

A. I believe it is.

Q. Then you come to another reservoir up at Maynard's, don't you?

A. Maynard's is on the main stream.

- Q. Wetherhee's is on the brook that comes in at Concord, just about where the new prison is, isn't it?
- A. I am not sure; there is a brook comes in near the new State prison, but I am not certain whether that is the one or not. Warner's mill is on it.
 - Q. How large is the Maynard reservoir, on the main branch?

A. I don't know, sir.

Q. The Maynard works are pretty large works, are they not?

A. Yes, sir.

- Q. Fed from a reservoir flowing a considerable number of acres?
- A. I suppose so. I am not informed exactly about it. I understand he has a large reservoir. He runs also by steam uses steam power largely.

Q. But there is a very considerable reservoir?

A. So I am informed; I think so; I don't know of my own knowledge.

Q. Then above that there are still other reservoirs?

A. There is a reservoir in Marlboro'; whether it is filled now-adays or not, I don't know.

Q. One made by the city of Boston?

- A. Yes, sir; I am not sure whether it is in use now or not. It was in use and got out of order; whether it has been made secure or not, I don't know.
- Q. On the Assabet, and on the brook which is called the Nashoba, there are several dams and manufactories?

A. Yes, sir.

- Q. To begin at the bottom: there is Warner's, near where it empties into the Assabet; then Wetherbee's; then the lead-pencil manufactory; then the slate-pencil manufactory; and then Robbins' mill?
- A. I don't know about that; I am not informed as regards all those mills; I know there are a good many.

Q. You have been at Magog pond, haven't you?

A. Yes, sir.

Q. It is a pretty large sheet of water, isn't it?

A. Yes, sir.

Q. About how many acres?

A. I have heard, but I don't remember; I should say 500 or 600.

Q. And the water is raised in that pond by a reservoir?

A. Yes, sir.

Q. How do you get the height of the dam at your place?

A. I have had it measured.

Q. Have you got that measurement?

A. No, sir; under the ordinary stage of water in the summer, a low stage of water, it is 11 feet. In winter, it runs a little less.

Q. In the spring, are you considerably troubled with backwater?

A. Yes, we have back-water in the spring.

Q. You are more troubled with back-water, than you are with too little water?

A. We are are never troubled so but what we can run speed. I have never seen the time, until last spring, that we have had to stop our woollen-mill, for back-water.

Q. But it diminishes speed very much sometimes, don't it.

A. No, sir.

Q. Do you mean that you run all your mills at speed?

A. Our woollen-mills run at speed.

Q. How is it with regard to the other mills?

A. The other mills are checked somewhat. Our head is so fixed that we can keep it up, and when the water rises we can hold it; consequently, we gain some head, as well as lose back-water, though not a full gain.

Q. You have been at no substantial outlay for water-power, except to put in your wheels, to use it, since you bought it, have you?

- A. We have repaired the dams, raised the canal, and improved our bulk-heads; taken out the wooden bulk-heads, and put in stone and cement.
- Q. Then, putting in bulk-heads to your dam, and making them permanent, putting in your wheels, and making the necessary repairs, have been all your expenditures for your water-power, have they not?

A. Yes, sir; largely so.

Q. The raising of the canal, was to raise the bank on one side to prevent a possible overflow in the winter?

A. Yes, sir, to make it secure; to keep up the head.

Q. To keep up the head in the winter.

A. Yes, sir.

Q. How many feet, in the winter, have you seen the water running over your dam, or in the summer, in a freshet?

A. Well, I don't know as I can state, positively; somewhere

about four feet, I should say, the highest.

Q. Does the Concord river keep up for a very considerable time in freshets?

A. Yes, sir; it usually falls slowly.Q. What part of the year is the water running over your dam?

A. Well, generally, when we are not using it. Q. You are always using it?

A. Well, I mean Sundays.

Q. Leave out Sundays? No, you may put that in now. When you shut down at night, does the dam usually run over Sunday?

A. Yes, sir.

- Q. Now, what part of the year does the water run over your dam?
- A. Well, I should say that it runs over some part of the time - probably nine or ten months in the year.
- Q. What part of the year does it run over all the time? How much of the year, on the average, does it run over all the time?

A. Well, I should think, in all probability, about eight months. On an average about eight months.

Q. The Concord is a pretty constant stream, is it not?

- A. Yes, sir; in the winter season it runs very close; sometimes it don't run over the dam.
- Q. That is rather due to the ice than a want of water, is it not?
 - A. Oh, it is due to the freezing of the water, I suppose. Q. It freezes solid at the fordway frequently, doesn't it?
- A. Oh no, sir. Sometimes in the winter we run very close, and Mr. Faulkner had to run by steam a year ago.

Q. Have you any record of it?

A. No, sir.

Q. You have never kept any water record there at all?

A. No, sir.

Q. When it is a certain distance below the top of the bolt, neither you nor Mr. Faulkner can run, by your agreement, until it fills up.

A. We can run.

Q. But you can only take an alaquot portion of the water?

A. We can only take a certain amount.

Q. How much is that amount?

- \mathring{A} . It has been estimated at about 400 cubic feet of water a second.
 - Q. And when do you begin to be restricted to that amount?
- A. Well, in the past, we have never made any very fixed rule about it.

Q. What is the rule in your deed?

A. The deposition that was put in yesterday was in the deed when we deeded to Mr. Faulkner; the reservation was in that deposition.

Q. You were restricted to that amount when?

- A. When the water is three-quarters of an inch below the top of the bolt.
- Q. When the water is three-quarters of an inch below the top of the bolt, then you can only use the water that will pass through the gates in the deposition?

A. Yes, sir.

Q. Then you may go on using that amount of water, and Mr. Faulkner must stop?

A. Yes, sir.

Q. When the water is above that, you can use as much as you please, and he too?

A. No; his deed limits him to 57.3 cubic feet a second.

Q. He can only use 57 cubic feet in any event?

A. Yes, sir.

- Q. And those were substantially the old canal mill-rights, on your side, and what the canal sold to others before you bought, on the other side?
- A. I don't remember the precise conditions of the canal deed; what it covered precisely. The limit in the deed to Mr. Faulkner is the limit as it was in 1833 and 1834; I don't remember what it was.
- Q. Yes, sir; but your restruction is substantially what the old canal mills was in 1833 and 1834?

A. What was used by the canal corporation in 1833 and 1834; what they had a right to use in their mills.

Q. Not taking into account what they had a right to use in their canal?

A. No, sir; not in the deed to Mr. Faulkner.

Q. So that the way the rights stand is this: when the water is three-quarters of an inch below the top of the bolt you can use the amount of water which ran through the old canal mills in 1833–34, as ascertained by Wilson's deposition; at that time Faulkner cannot use any. When it is above that point on the bolt you can use all the water, including that which the Middlesex canal used in their canal and on their wheels both, and Faulkner can use 57.3 cubic feet?

A. We can use all the water that runs in the stream if we please. The Middlesex canal was not running at that time; it was closed,

- Q. So I understand. My question and your answer amount to the same thing, if I understand it. When you say you have expended some \$400,000 there, how much of it has been expended on the acid works, which need no water for power?
- A. Some less than \$40,000; I don't remember precisely. Between \$35,000 and \$40,000, I think. It takes water out of the river, and it is all connected with our dyewood works. We regard one as useful to the other, and if the dye works were destroyed the chemical works would go with them.

Q. Why?

- A. Because we should regard one business as necessary to sustain the other.
- Q. You take your water out of the river to make your acid of, and that is all you want of the water in the acid works, is it not?

A. No power; boilers, and that is all.

Q. You have had two sets of acid works, haven't you?

A. Yes, sir.

Q. Does that amount cover the cost of both?

A. No, sir, it does not.

Q. Did you include the cost of both in your estimate of \$400,000?

A. No, sir.

Q. How much of the \$400,000 is machinery?

A. I can't tell you without figuring.

Q. Substantially?

- A. It would be an estimate; I should say, at least \$130,000; I don't positively remember; we did not separate it.
- Q. Am I correct in supposing that the \$400,000 is the amount of your construction account?
- A. Substantially; construction, land, and property connected; buildings, you know; dwelling-houses.

Q. How much is in the form of dwelling-houses?

- A. That I cannot tell you without looking. We own nearly all our own tenements.
 - Q. How much is your property taxed for?
 - A. That I don't remember.
 - Q. About how much?

A. I really cannot tell you. I have not seen the tax-list for years; for several years, at least. I have not returned a tax-list for some years, and the assessors tax what they think best.

JOHN GIBBS, sworn.

Q. (By Mr. Abbott.) You were a witness called here before, I believe?

A. Yes, sir.

Q. And you worked, as you told us, a long time at the Saxonville mills?

A. Yes, sir — since the fall of 1830. I left in 1865 or '66.

Q. During all that time, as I understood you to say, No. 3 mill was run by water?

A. Yes, sir.

Q. You stated before, I think, that the old breast-wheel was sixty horse-power?

A. No, sir.

Q. What was it?A. I don't know what the breast-wheel was.

Q. When was the turbine-wheel put in?

A. I could not tell you when No. 3 turbine-wheel was put in. It was years after I went there.

Q. About how long after?

A. I think Mr. Carter put in that wheel somewhere about 1861; at the time when they made their connection.

Q. How many horse-power was that wheel? A. About eighty or ninety horse-power.

Q. How large an amount of power was used in that mill while you were there, at the lowest and dryest times?

A. Constant use in that mill, about fifty.

Q. What other water was used — with reference to washing

and scouring?

A. They used what water they wanted for washing and scouring in the basement of No. 4, where it was nearly all done, washing and scouring of the cloths and rinsing worsted yarn.

Q. Now was there another wheel in what is called the machine-

shop constantly in use?

A. There was; a small turbine-wheel of about $15\frac{1}{2}$ -power.

Q. Whether that was always in use?

A. Yes, sir.

- Q. Now tell me, during the dryest times, as near as you could approximate to it, how many horse-power would be constantly in
- A. We always ran, No. 3, which would be about 50-horsepower, and the machine-shop ran by water, which would be about 15, making about 65. To the best of my judgment, I should think in the basement there were two large rinsing-tubs, four feet deep, with their two large wash-tubs; I don't know the dimensions of those; they were quite long; ten feet or more; I should think that they used 75 or 80-horse-power of water in all; it

was all the time in washing; used No. 3 in washing and in rinsing.

Q. And that at the dryest times of the year?

A. Yes, sir, at the dryest times of the year, and at all times.

Q. Making ten or fifteen horse-power in washing?

A. Yes, sir.

Cross-Examination.

Q. (By Mr. Butler.) Fifty in the No. 3 mill, fifteen in the machine-shop, and about ten horse-power for washing?

A. I should think more than ten horse-power for washing and

scouring purposes.

Q. Under what head did they let the water in for washing?

A. They took it from the canal under No. 2, I think.

Q. Under what head was it?

A. Well, I think the fall of No. 2 mill, is about twenty-one feet, and this must be certainly from five to eight feet lower, set in behind and down the hill.

Q. Five to eight feet lower than No. 2 mill?

A. Yes, sir. I should think so.

Q. And how large an extent was the opening pipe which they let into the tub? How large was the orifice?

A. I could not tell—not being closely connected with that

department.

Q. You have given us an idea of the horse-power. I want to get at what means you have of knowing. If you did not know how large a hole the water came out of, how could you tell?

A. Well, it is close work always and requires a great deal of

water.

Q. How large a hole did it come out of?

A. I could not tell you.

Q. What sort of pipes were they?

A. Iron pipe, I think.

Q. How many inches?

A. I never saw them. I could not tell you. Q. Did you ever see the orifice of them at all?

A. I don't remember that I did of the pipes. I have seen the boxes into which the water flowed.

Q. How large was the outlet of the boxes out of which the water flowed?

A. I could not tell. I never measured them.

Q. Give your judgment. I want to get the means by which you make up your judgment. How large a hole did the water flow out of?

A. Well, I cannot give you my judgment on that because it is a

thing I don't know.

Q. How did the water get out of these tubs. Did it go from one to the other?

A. No, sir. It would be dirty water then, and it would be of no use.

Q. Do you say there would be two?

A. There were two rinsing-tubs for worsted. There were four in all, — and two scouring-tubs.

Q. Now, how large an aperture did the water run out of in each

of these tubs?

A. I could not say. Q. Was it a foot?

A. I could not say whether it was a foot or one inch?

Q. Did it run out of an aperture in the tub somewhere when they got through?

A. When they got through it did by hoisting a gate, and that

was all.

Q. Did it run all the time, or did they fill up the tub and then stop for the water to wash their wool, and then let it off?

A. In the yarn-tub I think it did, but in the scouring-tub it did

not run all the time.

Q. Now, can you give me any idea how large a hole it ran out of in either of the tubs, whether one inch or one foot? You don't know? How then do you get at the amount of water that was used, in your judgment?

A. Well from being partially acquainted with their scouring

and rinsing apparatus, &c.

Q. How many millions of gallons a day do you suppose ran through those four tubs?

A. I could not tell you.

Q. Was it one million or five?

A. I could not say. I could not state it at any point.

Q. Was it half a million or ten millions?

A. I could not tell you.

Q. Well, give us your best judgment, by which you made up the horse-power, how many millions of gallons ran there?

A. Well, perhaps I might state it at a million gallons a day; it

would be only a rough calculation.

Q. It is the same calculation upon which you fixed it?

A. Yes, sir.

Q. I observe that Mr. Simpson reserved a million and a half gallons in the act?

A. Yes, sir.

Q. Should you think it was more than that?

A. Well, I could not say.

Q. Well, state in your judgment, the same as you have testitified to here under oath. In your judgment, do you believe it was more than a million and a half gallons a day?

A. I should not say that it was.

Q. How much horse-power will a million and a half gallons per day over a 30-foot fall make?

A. Well, I don't know. I could not tell you.

Q. Would it make one horse-power?

A. I could not tell you anything about it.

Q. Would it make half of one?

A. I should not set it at anything, because I don't know.

Q. Then if you do not know, and you think there was a million gallons per day, and do not know how many horse-power that will make, why do you say ten horse-power?

A. Well, that is my best judgement.

Q. I wanted to know if you had any judgment on the subject. A man may give the best he has, and still not have any to give. Now, can you give any idea how many horse-power a million gallons would give over a one-foot fall?

A. No. sir; I am not posted in that, sir.

Q You would be a little surprised to find that it would not give one horse-power?

A. Yes, sir.

Q. If it should turn out, upon calculation, that it did not give one horse-power, you would come to the conclusion that your judgment in all vov have been testifying about in respect to horsepower was all wrong, would you not?

A. I cannot answer the question.

Q. Very well; then it is calculated that a million gallons a second, not a million gallons a day, over a one-foot fall, will give one third of a horse-power?

A. Well, I am not posted in that. I could not have answered

Q. Now assuming that to be correct, how many horse-power do you think those washing tubs give.

[No answer.]

Mr. Butler. I will not trouble you any farther.

Mr. Abbott. Do you mean, Gen. Butler, that a million gallons a second over a one-foot fall would give one-third of a horse power?

Mr. Butler. Yes, sir. Mr. Somerby. Oh, no, sir.

Mr. About 75 gallons a second would give a horse-

power over a one-foot fall.

Mr. Butler. I assume what I say to be true — that it requires a million gallons a day to give one-third of a horse-power, and it must run every second.

EDWARD O. HOLMES, sworn.

Q. (By Mr. Abbott.) Where do you reside?

A. In Malden.

Q. What is your business, and where?

A. My business is in Boston. I am a mill-wright.

Q. How long have you been so engaged?

A. For twenty years.

Q. Has your business been to put in water-wheels and steam power?

A. Yes, sir. Q. For how long?

A. For the past fifteen or twenty years.

Q. And to a considerable extent?

A. Yes, sir.

Q. So that you are an engineer, and also practically engaged in the business of putting in water-wheels and steam-power?

 Λ . Yes, sir.

Q. And you have been so for fifteen years?

A. Yes, sir.

Q. Have you made an estimate of the amount of water, by the old gates in 1833 and 1834, by George O. Wilson's deposition?

A. Yes, sir.

Q. Won't you turn to it?

- A. (Witness finds it.) The new mill, by the deposition of George O. Wilson, would be three gates sixteen by sixteen, that is, sixteen inches square, under a seven and one-half feet head; three gates fourteen by ten, same head; one gate fourteen by fourteen, under the same head; and one nine by ten, under the same head.
- Q. How much do they give you per second, how many cubic feet, take them all?

A. 14,182.2 cubic feet per minute.

Q. All the gates, in the new grist-mill, under the deposition, as numerated here?

A. Yes, sir.

Q. How many per second?

A. 236.3 cubic feet per second.

Q. Now, take the saw-mill, by the deposition, and give us the dimensions of the gate that you estimated on, so that we can com-

pare them.

A. One gate thirty-six by eight, under six feet head; one gate fourteen by twelve, under five and one-half feet head; one gate seventy-one by five, under a seven feet head; one gate seventy-two by five, under a seven feet head; one gate fourteen by twelve, under a five and one-half feet head.

· Q. What is the result there?

A. 11,277.18 cubic feet per minute.

Q. Now give it per second.

A. 187.7.

Q. Put them together, the grist-mill and the saw-mill.

A. 405.52 cubic feet per second.

Q. You have given now the gates that you have estimated upon, and the head under which you have estimated it, by the deposition?

A. Yes, sir.

Q. Now, did you get from Mr. Talbot the discharge from his wheel, by its present use, as he gave them to you?

A. Yes, sir.

Q. Taking it as he gave it to you, will you give us the amount of the number of feet per second which they described, — the six wheels, — the whole? Thus, there are six wheels that he has in all that you estimated upon?

A. Eight wheels.

Q. Give us the six of the dye-wood wheels?

A. I have them all together, and not separated. The number of cubic feet per second discharged by all the wheels, is 420.5 for eight wheels. That is eleven feet four. That was given me.

Q. Give us the number of cubic feet per second over a one-foot

fall that is required to make a horse-power?

A. Eight and eight-tenths feet per second; five hundred and odd feet per minute.

Q. That is the theoretical horse-power?

A. Yes, sir.

Q. Practically, in applying it to a wheel, how much out of the theoretical quantity do you get?

A. I seldom figure more than seventy-five per cent., although eighty and even eighty-five is claimed. I think seventy-five is fair.

Q. That is, you get effective power practically seventy-five per cent. of this theoretical power, if you get hold of it?

A. Yes, sir.

Q. Instead of getting one horse-power by 8.8 cubic feet, you get practically three-quarters of a horse-power?

A. Yes, sir.

- Q. I want to ask you what is the horse-power of the two wheels in the brick woolen-mills?
- A. There is one eighty-inch Boyden wheel, 92.28 power; one Swaine wheel, six feet diameter, 95.55 power.

Q. Making a little less than 200.

A. Yes, sir. Q. Is that the theoretical power?

A. That is the actual power.
Q. Making of the two, how many?

A. 187.73.

Q. Now, sir, did you go up to examine for the purpose of seeing how steam could be applied to be used in the woollen mills?

A. Yes, sir, I did. Q. More than once?

A. I went up twice.

Q. Did you make a careful examination?

A. I did, sir.

Q. Will you give us the result of the cost of putting a steamengine, say, in the first place, of four hundred horse-power? But before I come to that, I want to ask you another question. Taking this supposed case: if you have a mill requiring two hundred horse-power to run it, and you are obliged to run eighty-four of it, taking the theoretical division — eighty-four of it by steam and the balance by water, — I want to ask you whether eighty-four horsepower in steam would actually in practice supply the loss of this eighty-four horse-power taken from the water-power, or whether you would have to have a large amount in order to get a smooth even-working mill?

A. Yes, sir; I should want a much larger amount than the actual

power needed.

Q. I want to ask you whether there is any means of fixing exactly what that may be?

A. No, sir; I don't know of any rule more than would suggest itself by practical knowledge in such matters.

Q. Have you ever had any experience in such matters? A. Yes, sir; I have had experience in that matter.

Q. What was the result where you undertook to supply simply the loss of water-power by the wheel?

A. The result would be in practice and irregular motion. Q. Would it produce any effects on machinery?

A. Yes, sir; where the power was transmitted by gearing, there is great difficulty in taking out the cogs. The cogs are broken by the irregular motion. Where it is transmitted by gear, it is very difficult to get them to stand.

Q. Has that been within your own personal knowledge?

A. Yes, sir.

Q. Now take this case: suppose 80 horse-power was taken from a mill of 190 water-power, and you were obliged to supply that deficiency with steam; how much steam would you want in order to get the same regular motion in that mill as if you had all water-power?

A. I say there would be no regular rule; but I would put in 100 horse-power — certainly as much as that, — from that to 125.

Q. In that way you would get a more even motion?

A. Yes, sir. In that way, I would get a more even motion. Steam would regulate quicker than water, and the effect of the large balance-wheel would steady the motion a good deal.

Q. Give us the estimate you made of the expense of putting in

a 200 horse-power engine. Give it to us in the gross.

- A. I put the whole expense of putting in a 200 horse-power engine at \$25,847.12. That putting in the buildings, boilers, shafting, belting, and all necessary fixtures to attach to the main shaft.
 - Q. Was that made from personal examination?

A. Yes, sir.

Q. Will you tell us the expense of putting in a 100 horse-power

engine in the same place, covering the same items?

A. The estimate cost of 100 horse-power, (I am taking now only the engine), the shafting and other machinery would be about the same; the engines and boilers, foundations and fixtures would cost \$7,645. The buildings would be but a little difference.

Q. Will you give us the amount of buildings, so as to add the

whole expense of the 100 horse-power engine?

- A. The difference would be simply in the engine. I can give you the estimate on the other engine. I will give you 200 horse-power estimated from the same data. The 200 horse-power would be \$12,650 in engine and boiler and fixtures. The 100 horse-power would be \$7,645, making \$5,005 difference. The cost of 100 horse-power, including the buildings and everything, would be about \$20,000.
- Q. Now give us the cost of an 80 horse-power engine figures from the same data.

A. It would cost \$6,517.

Q. In place of \$12,650?

A. Yes, sir.

Q. The other expenses about the same?

A. The buildings would be reduced somewhat. The boiler-house would not be as much, and the engine-house would not be quite as large. The difference would not be very great; perhaps 20 per cent. less cost on the buildings all through.

A. The building in round numbers would be reduced about 20.

per cent?

A. Yes, sir.

Q. Then it would make \$17,000 for an 80 horse-power engine. Now have you had occasion to estimate the cost of keeping up a horse-power, say in the neighborhoods of Boston and Billerica; perpetually maintaining it, reproducing the original plant, and keeping it up? What would be the cost per year?

A. Yes, sir; I have had occasion to go into that many times, and have figured it lately. I have figured here the cost of maintenance of all these different-sized engines that I have enumer-

ated.

A. I want to know if you can give us in the aggregate the cost per year for a horse-power, not only of maintaining it, but of keeping it running and keeping it going forever?

A. I have figured the cost at about \$115 for a horse-power; running, from \$110 to \$125. Different circumstances and different

locations will alter the figures somewhat.

Q. Take the location at Billerica Mills. What would be, in your judgment, the cost of a horse-power?

A. I should think somewhere about \$110 by steam.

Mr. Butler. Is that including or excluding the plant?

Mr. Abbott. This includes what they call depreciation, which means reproducing the original plant forever.

Q. How much do you reckon it for depreciation—to keep it

a-going?

- A. Circumstances alter the case somewhat; but a fair depreciation, taking everything into the account, would be about 10 per cent.
- Q. Reproducing it at the end of ten years, it would be a little over that, then. What did you reckon your coal at, at Billerica, in coming to this conclusion? How much per ton?

A. I reckon, \$8 per ton as a fair average. It is very low

at the present time.

Q. Did you make an estimate upon Mr. Falconer's?

A. Yes, sir.

Q. To put in a 54 horse-power engine, what would it cost; all the expenses?

A. The cost of engine, boilers, steam connection &c.

- Q. (Interrupting.) How much more would 54 horse-power cost than 50?
- A. Well, perhaps 5 per cent. It does not vary much; but still it would enlarge the cylinder somewhat. I put the cost of engine and boilers at \$3,795. That includes engine, boiler, setting, piping and fixture.

Q. You say 54 horse-power, would cost about 5 per cent.

more?

A. Yes, sir.

Q. Now did you make an estimate of the necessary expense of putting such an engine up at Falconer's?

A. Yes, sir; I figured it.

Q. Was that inside of the mill or outside?

A. That was inside of the present mill; where it is now located.

Q. Well, what would be the expense of putting in?

A. I figured on the buildings, and they are building a new boiler-house, — about \$1,200 for the buildings.

Q. Which would be added to that?

Yes, sir; outside of the present location.

Q. Then in your judgment is that enlargement necessary, when

you run six months in the year by steam?

A. Well, I should not consider that fifty horse-power engine was large enough to do the work there, or a fifty-four horse-power engine either. To substitute a fifty horse-power engine for a fiftyfour horse-power water-wheel, I should figure for some surplus. I should not figure less than a sixty-horse-power engine to supply the force that a fifty-four horse-power water-wheel supplies. But to do it economically, it would be much better to run seventyfive horse-power than to reduce it to sixty.

Q. What would be the cost of a seventy-five horse-power

engine?

A. That is what I figured upon at the mill. The cost of that with the boilers and piping necessary to connect, and other fixtures, and the main-belt, which I put in there, which would be necessary to connect on to the main-shaft of the water-wheel. — Those figures I placed at \$5,750.

Q. That is for a seventy-five horse-power engine, and the

building the same?

- A. Yes, sir; the building would be about the same in either case.
- Q. Can you give us, sir, the expense of running by the day a 50 horse-power engine?

A. Yes, sir.

Q. You figure coal at \$8.00 a ton, I believe you said?

A. Yes, sir.

Q. Give it without the interest and insurance.

A. Without the interest and insurance, it would be \$12.60.

Q. How much for a 54 horse-power engine?

A. It would be increased about 5 per cent., perhaps.

Q. That would be about \$13.50?

A. Yes, sir.

Q. Now tell us what that \$12.60 includes.

A. It includes fuel, engineer, no fireman, the oil and waste for cleaning the engine, carting away the ashes, and extra time that it takes more or less always of extra men cleaning out the flues and connections of the boiler, which amounts to something each year.

Q. Do you only reckon one per cent.

A. One per cent. only. The engineer ought to be capable of running this 50 horse-power engine without a fireman.

Q. Take the repairs?A. They are nothing but the ordinary repairs. There is nothing for depreciation.

Q. What are the ordinary repairs?

A. I have neglected to figure the repairs. I see that in this other one I had it, but — or most of them; but by some means, I have neglected it here. Ordinary repairs on a 50 horse-power engine, if figured by the day, would be about twenty-five cents per day.

Q. That would add to a 50 horse-power engine's expense so as to make it \$12.85 per day.

A. Yes, sir. Q. You would give it at twenty-five cents a day? A. Yes, sir, that would be a very low estimate.

Q. Then you add 25 per cent. for a 54 horse-power engine in-

stead of one of 50 horse-power?

A. Yes, sir. In regard to the gates, I take it as it was given — Q. (Interrupting.) That I understand includes simply the daily expense of running a 50 horse-power and a 54 horse-power engine, without any reckoning for depreciation, interest, or insurance?

A. I did not add in the insurance; no, sir.

Q. Now I want to ask you one further question. Whether if you run an engine half of the year, or a portion of the year, the depreciation would be greater or less in practice than if you ran the whole of the time, supposing that it be properly kept — engine and boilers.

A. Well, sir, there would not be much difference really. That is, if you should run certain portions of the year only, the boilers would probably depreciate as much from lying still as they would

in running, — that is if we get good soft, fresh water.

Q. Then take your engine, state whether practically there would be any difference in running it the whole of the time or only running it a portion of the time? You say yours is only used part of the time?

A. Well, sir, there would not be much difference, practically.

Cross-examination.

Q. (By Mr. Butler.) Now we will go back to the matter of gates: You said you calculated some of the gates under a 7½ feet head, and some under another?

A. Yes, sir.

Q. Where did you take the head to be?

A. I took the head as they gave it to me in the deposition, and with the full head. I took it at the bottom of the gate or I suppose so; I don't know.

Q. That is you assume the estimate from the gate?

A. I assumed it to be 71 feet a head. I cannot say as to the

Q. Where did you get your data to go upon? You assume that it is 7½ feet a head from the bottom of the gate?

A. Well, I suppose rightly it should be figured at the centre to get an average.

Q. Where did you get it?

A. I figured from a 7½ feet head. They did not tell me whether it was the bottom of the gate or the centre.

Q. You figured that so much water would run through a certain aperture in a certain time under a $7\frac{1}{2}$ feet head, or a 12-inch gate.

Now did you figure it running under a $7\frac{1}{2}$ feet head at the bottom,

centre, or top of the gate?

A. No, sir; I did not figure it at the bottom. I should assume that it was from the centre of the gate, with the $7\frac{1}{2}$ feet head,—assuming that that was the way the deposition might read.

Q. Leave out the deposition. Now, what calculation did you

make?

- A. If you should tell me to figure it at $7\frac{1}{2}$ feet a head, I should figure it from the centre of the gate. I figured this with a $7\frac{1}{2}$ feet head, supposing it was measured in this way. I don't know how it is measured.
- Q. But you yourself assumed that it was measured from the centre of the gate?

A. Yes, sir.

Q. Have you got that calculation?

A. No, sir. I have not got the figures.

Q. I wish you would give them to me. Have you got them anywhere?

A. Well, I may find them. I don't know.

Q. Would it take a considerable time to do it, — having taken on gate?

A. Yes, sir.

Q. When you leave the stand, won't you please sit down and figure it for me? I would like to know just how you figure it?

A. Yes, sir.

Q. What kind of a gate do you assume it to be?

A. I don't know, I'm sure. It might have been an iron gate, and it might have been a wooden gate. I suppose when they were both open, it would not alter the case much, wnether it were an iron gate or a wooden one.

Q. I was referring to the shape or form, and the manner of hoist-

ing or opening?

A. I supposed it was a square gate, which was measured at its full capacity,—which had been drawn up.

Q. Did you take into account at all the state of the aperture,

whether it went through a wide aperture or not?

- A. No, sir; I did not know whether it was 3 or 4 inches, or whether it was one inch. Of course the deeper the water, the more the friction or resistance.
- Q. And it was sometimes, as in the case of the old mill, opened by raising, as I now illustrate, by being drawn up?

A. I took it to be a perpendicular gate, but I had no means of

knowing.

Q. All these matters to which I have been calling your atten-

Q. All these matters to which I have been calling your attention would make a very considerable difference in the figuring?

A. Anything that makes resistance to water, or friction, and re-

tards the flow, of course has its effect.

- Q. Take simply what is said in the deposition, that there were so many gates, of such a size, under a $7\frac{1}{2}$ feet head, is there any very considerable accuracy to be got from that description of the flow of water through those gates?
 - A. I don't know why we should not come at it exactly.

Q. You could tell easily the largest amount of water which could flow through such a gate?

A. Yes, sir.

Q. And that you took, I suppose?

A. Yes, sir.

Q. But you make no deduction for any obstruction of the water,

or anything which would reduce that maximum?

A. Nothing towards flowing through a wheel. There had to be a deduction, because there is theoretically a certain number of cubic feet of water that will flow through an inch aperture. Multiplying by that coëfficient, would give us the amount of water that would flow through ordinarily.

Q. You made no difference for disturbance of the wheel?

A. I did not figure the wheel at all. I assumed there was no wheel there, and that the gate was discharging so much water.

- Q. That is to say, what theoretically would flow through an aperture of a given size, as described in that deposition, if it was opened. I am not criticising your method, but only ask you what you did. Is your calculation anything more than the amount of water that would flow through such a hole, under such a head, under the most favorable circumstances?
- A. That was what I figured, sir, —on what water would discharge through an opening of a certain size, assuming that to be without restriction of the water, under the most favorable circumstances. I knew what the wheels were, I think.

Q. What deductions did you make for any obstructions by the wheel?

A. I figured the obstruction to the water I think 90 per cent.—nine-tenths of the discharge. I took from a formula, what would flow under that head, with one square inch of water, and multiplying it by the number of square inches of the gate, and then I took nine-tenths of that to be the actual discharge.

Q. That is to say, you assume that I have got such an opening

under a seven and one-half feet head?

A. Yes, sir; I assume that I have got such an opening under a seven and one-half feet head. Now, by the formula which I have used, that will give me so much water. Now I assume the efficient force of the wheel to be nine-tenths of that. I say that I multiplied by the formula, and take that to be the actual discharge through such an aperture.

Q. And then you will diminish that by one-tenth and give us

that result? Is that so?

A. That is what I said before; I took nine-tenths.

Q. Now, what formula did you use?

A. I consulted several.

Q. What one did you use?

A. I think I used a formula by Mr. Commissioner Francis.

Q. That undoubtedly was a good one, if you used it; but did you use that one?

A. I think I did; I am not positive.

Q. After you get your calculation made, will you give it to me bye-and-bye? Now I've passed to the use of water and steam to-

gether. Suppose you had 187 power of water-wheel, — or a water-wheel giving $187\frac{1}{2}$ horse-power, — and you were obliged to supplement one-fifth of its power by steam. Suppose that one-fifth of the power is lost for some reason, and you have got to supplement that by steam, how large a steam-engine would be put in?

A. One-fifth loss would be about 38 horse-power — calling it at 190. Now, to supply that, I should put in a 60 horse-power

engine.

Q. That is, one that was rated at 60 horse-power?

A. Yes, sir.

Q. Now using a steam-engine in connection with a water-wheel, giving 38 horse-power, which runs the steadlest, the steam-engine or a water-wheel, under a steady head?

A. The water-wheel runs a little more regular, where the head is steady, because we have in the steam the head of steam varying constantly, while in the water-wheel there is no sudden variation.

Q. Now, which would you allow to be the regulator, in such a combination; a 30 horse-power engine, and the balance a water

wheel, both running together at 187?

A. I should rather the engine should regulate the water-wheel, because in such case I would have a very heavy balance on the engine. I would rather regulate by the engine, — by the most uneven power.

Q. But having an even power, is there any difficulty in applying

an addition of 38 horse-power?

A. Well, I have seen practical difficulties in putting on an en-

gine of the same capacity of the water-wheel.

Q. I am not dealing with the same capacity. My proposition is:—is there any difficulty in regulating an engine that had 38 horse-power out of 187, to a steadily running water-wheel, the two together making up 187 horse-power?

A. Yes, sir. I think there are practical difficulties there—

some.

- Q. Anything that the science of steam-engineering has not overcome?
- A. You can overcome almost anything in steam engineering; but, practically, I should prefer to put in a larger steam-engine—60 horse-power.
- Q. Then having a steam-engine of 60 horse-power to give you 38 horse-power, and applying that to a set of shafting which require 187 horse-power, the difference between the 187 and the 38, to be supplied by a water-wheel; is there any difficulty in uniting those two powers?

A. If you will allow me to explain:—in the 60 horse-power engine you have but 38 horse-power to supply, at any rate, and if you have 60 horse-power to supply it with, I say it will run steadier with [that 60 horse-power than it would if you were run-

ning the engine at 38.

Q. But having the 60 horse-power engine in, to supply 38 horse-power, and having a steadily running water-wheel to supply the remainder, up to 187 water-power, is there any practical difficulty in running those two together?

A. No, sir, there would not be any practical difficulty. It would be better to run the 38 horse-power from the 60 engine than from the 38.

Q. I agree. But having the 60 horse-power in your engine, and having got the balance in your wheel, is there any difficulty in supplementing the wheel with 38 horse-power out of the 60 horse-power engine?

A. There is no difficulty in that, if it is transmitted by a belt. If it must be transmitted by gearing, there will be practical diffi-

culty.

Q. Now if you were to put in an engine at Billerica, would you transmit the power by a belt or by gearing?

A. I should by belt there.

Q. And where the belt is used, there is no substantial difficulty, is there?

A. The belt cuts his basement through.

Q. I am leaving that out. Now I am trying to get the power in; we will see when it cuts in and hurts the basement. Answer the question: is there any practical difficulty in supplementing water-power with steam-power by a belt.

A. No, sir; no difficulty in transmitting the power from the

engine to the water-power shaft by a belt.

Q. And running a 60 horse-power engine, supplying 38 horse-power would be quite as economical as it would if you only run a 38 horse-power by itself, would it not.

A. Yes, sir. The maintenance would be, I think, as economical;

that is my theory always.

Q. That is to say, if you yourself had to run a 38 horse-power engine in that way, as a steadier, you would prefer a 60 horse-power engine to do it, as a matter of economy?

A. Yes, sir, I should.

Q. What do you mean to tell us is the least amount that a man at Billerica could let 10 horse-power of steam for where he was

running his mill by steam?

A. If he were to let 10 horse-power at Billerica from an engine, with which he was running his own mill, supposing he had this 10 horse-power as a surplus, to get a fair compensation, a man ought to get \$125 to \$150 dollars for a horse-power, allowing the balance over the cost as profit from \$110; I should give \$110 per horse-power as the cost; perhaps it would be \$108, giving \$15 per horse-power profit. I am not putting in the element of rent of the shop, how much he ought to have per horse-power on the shop. As a surplus, he could let it a little cheaper than he could if he was making it at his own cost.

Q. You think then, that every horse-power of an engine, up to

200 horse-power, costs \$110 a year to create it?

- A. The larger engine would be a little more in proportion to what a smaller one would be. I figured on 80 horse-power, I think.
- Q. Do you think a man cannot make 80 horse-power short of \$115 per horse-power?

A. Somewhere from \$110 to \$115.

Q. Is that an actual cost to him?

A. It depends upon the engine somewhat.

Q. Suppose he has a good engine. I am not going in for a bad one. I want to know if you testify that a man cannot produce in Billerica a horse-power from 80 to 100, or from 75 to 80, anywhere along there, short of \$110 to \$115 cost per horse-power?

A. I will set it at \$110 per horse-power, taking the contingent

expenses.

Q. It will cost him that, and he ought to have some \$10 above that for profit?

A. Yes, sir.

Q. Which would cost the mill to make a horse-power at Billerica, or we will say upon one of the manufacturing streets of

Boston, how much?

A. I don't think there would be much difference. You would have in one case the cost of the water, which in Boston might compensate for the increased cost of coal at Billerica. In Boston we have to pay for our water, but in Billerica probably there would be no cost but the pumping.

Q. Well, now, how much horse-power do you suppose is let in

Boston to-day for \$100 per horse-power per year?

A. I don't know how many foolish men there are in Boston.

Q. Of course, men do not understand their interests in Boston very well, but with all their folly, how many do you suppose there

A. I will say that very few men in Boston know what the cost of a horse-power is, or make any calculation in regard to it.

- Q. But they mean to live by letting power. Don't you know that there is a large amount of horse-power in Boston that is sold at the rate of \$100?
- A. I am not aware of the fact. I have been letting horse-power in Boston for fifteen years. I have never let any for that. What I let for is \$150.
 - Q. I mean actual, not nominal?

A. Well, that is actual horse-power.

Q. How much do you let to any one individual at that price?

A. Well, we have one printing-office, I think, that takes four or five horse-power. The power is divided up among quite a large number of tenants; and a large amount of the power is taken up in the transmission.

Q. How much is your engine rated at?

A. Our engine is a 16-inch cylinder.
Q. How much is the horse-power? I don't care about the size of the cylinder.

A. It depends upon how many feet we carry.

Q. Pardon me, now; don't fence. How much is it?

A. Its measurement is 16×42 , and it is rated, I suppose, at 80 horse-power. The stroke of the engine is 42.

Q. How many tenants do you let that to?

A. I will say that I do not run 80 horse-power, — let it or run it. I use about 40.

Q. How much do you let the power produced by that engine for? To how many different tenants do you let it?

A. If you will allow me a few minutes, perhaps I will figure it

up. I should think likely there would be about ten tenants.

Q. Where is that building? A. It is in Haymarket Square.

Q. Do you let the horse-power independent of the building? A. Yes, sir.

Q. How much do you let to any one man? A. Well, sir, I don't know that I could tell you.

Q. What is the largest amount that you remember that you let to any one man?

A. I think about six horse-power.

Q. How much is the smallest amount to any one man?

A. I think we run down to about three-fourths of a horse-power, nominally. We don't figure it entirely by horse-power in letting. If a man wants to come in and run so many lathes or so much machinery, I say to him that I will give him a three-inch belt for so much.

Q. Now, how much do you get for the actual horse-power used?

A. I don't know, sir. I could not tell, without reference to our books, how much we did get, because we used power ourselves; and it is somewhat in this way: - things are very dull, and a man says, "I am paying you a thousand dollars for this horse-power, and now I am going to move out unless I can get my horse-power for six hundred dollars." I say to him, "I would rather you would stay here than lose you as a tenant." It is a very difficult matter to figure it exactly.

Q. That is, you would rather let him have horse-power at \$100, that it costs you \$110 or \$115 to make, than let him go. You would not get rich if you had a great many such tenants, would

you?

A. They would not all operate in that way, perhaps. We might make on one what we lost on another. I would make my average come out right if I could.

Q. What is the establishment that you carry on there?

A. We manufacture machinery, gearing, pulleys, shafting, and

all such things.

Q. The manufacture of machinery, then, is your business; and your whole horse-power, so far as you are concerned, is 40 horsepower?

A. 40 horse-power is what we are using. The engine is larger

than that.

Q. Pray, sir, do you have a separate building for your boiler?

A. No, sir; it is in the basement of the building. Q. What would be the fair rent of your building?

A. We have two boilers, and run but one. Q. What is a fair rent for your building?

A. We do not own any building. We hire our building.

Q. What do you pay for your building?

A. I do not recollect, exactly. I could not tell without reference to our books.

Q. Well, about what?

A. We rent but four or five stores, which we underlet. I guess somewhere about \$7,000 for the stores.

Q. I don't care what you let for to other people. What do you

pay?

A. We pay and then underlet. We hire the building, underlet the room, and let the power, which we make ourselves.

Q. Where is the building?

A. The building is on Haymarket square. It is what is called "Haymarket block."

Q. Now, in transmitting small powers in that way, is there not

a third lost, at least?

A. There is great loss in transmitting. There is the friction of the shafting.

Q. Is there not a third lost?

A. I have never made that calculation. I should think in the transmitting of power, actually, there might be something like that lost — 25 per cent.

Q. In breaking it up into small powers, of course, all powers have to be transmitted through belts or gears, and you have fric-

tion for that. How much is actually lost in that way?

A. I am not able to tell the percentage, if you come to that point.

Q. Have you ever carried on any other business elsewhere?

A. Well, I have been there in Haverhill street and Haymarket square as long as since 1861.

Q. That has been your business since 1861?A. Yes, sir.

Q. You don't build steam-engines?

- A. No, sir; we repair, and repair and put up our own. We don't make them.
- Q. Suppose you are running an engine of 200 horse-power, and you are using 100 horse-power of it, is there any other expense in making 25 horse-power more, other than the coal you use?

A. No, sir; the expense above the coal would be very slight,

if any.

Q. How many pounds of coal do you give to a horse-power?

A. Well, allowing for all contingencies, and making an outside average, I should allow about 4½ pounds. It may run to four, and may run even lower than that, on a first-class engine, and where everything is favorable.

Q. Let us say 4 pounds of coal for a horse-power. For how

long?

A. $4\frac{1}{2}$ per hour. We figure a day at ten hours.

Q. That would be 45 pounds of coal per day per horse-pow r?

A. Yes, sir, — at ten hours.

Q. And for 300 working days in a year?

A. Well, 307 or 308, I think. We generally reckon seven or

eight holidays. Legal holidays we are not obliged to run.

Q. And yet you think if a man ran an engine at 100 horsepower, and let 10 more, it would cost him \$110 a horse-power extra. Is that so?

A. I don't think I made such a statement.

Q. I thought so.

A. I am taking a general average of the whole power of an

engine.

Q. Pardon me. I put the exact question to you, what Mr. Talbot could afford to let ten horse-power for in his mill, if he was running an engine of a certain size, and had ten horse-power surplus, and you thought he could not let it short of \$125 a horse-power, and that it would cost him \$110 a horse-power,— if I understood you right.

A. Yes, sir; the balance would be a profit.

Q. And you put in the difference between \$110 and \$125, for his profit?

A. It would be so much more profit if it only cost him the coal.

Q. You say that it will only cost him the coal?

A. He would not be obliged to employ another engineer.

Q. We understand that it would not cost any more. Explain why it would not. I believe, however, I will not trouble you any more. I will ask you, though, to give me that calculation on one gate. I don't care for but one of them.

Mr. Abbott. He will give it to you.

Redirect.

Q. (By Mr. Abbott.) I want to know whether those apertures are calculated to discharge the ordinary quantity,—whether there is anything in them that would interfere with the discharge of the ordinary quantity?

A. I take them 16×16 . There is nothing more than ordinary. If they are put in under favorable circumstances, and by any com-

petent mill-wright, they ought to be able to do that.

Q. Take the next saw-mill; state whether those are ordinarily well fitted to discharge?

A. Yes, sir; these are the customary sized gates.

Q. Then you told me that you measured so as to get your head from the centre of the gate?

A. I assumed it to be the centre.

Q. Whether that is the ordinary and usual method?

A. I think that would be the usual method, — taking it from the centre of the gate.

Q. At any rate you took it from the centre of the gate. Now, I want to ask you what would be the cubic feet per minute discharged

by a six-inch pipe, under a 22-feet head.

A. I don't know as I know exactly what the area is. I should think (without going through the formula) that the area, by a rough calculation, would be about 30 inches; and, under a 22-feet head, it would be about 15 cubic feet per second, or, I think, about 900 cubic feet per minute, — assuming the area to be thirty inches.

Q. That would be in the rough?

A. Yes, sir; I think that would be about the discharge.

CHARLES FAULKNER, sworn.

Q. (By Mr. Abbott.) You are a son of Francis Faulkner, or Squire Faulkner, as we used to call him?

A. Yes, sir.
Q. You were born in Billerica;

A. Yes, sir.

Q. And lived there till when?

A. I lived there till 1827, and then came to Boston.

Q. And are there at the present time?A. Yes, sir.

Q. You and your brother James are owners of these mills, and have been since the death of your father?

A. Yes, sir. Q. What was the date of that?

A. He died, sir, in 1843.

Q. Your land, as you told us before you were sworn, extends up the Middlesex Canal, on the east side, and so on down for half a mile or less?

A. Yes, sir, below the fall.

Q. The old "Mears' saw-mill," as I understand you to say, then stood, a part of it, where your present mill stands?

A. Yes, sir. That was the basin that supplied that mill. It

came within 15 feet of the old mill.

Q. This "Mears' saw-mill" was on the east side of the river?
A. Yes, sir.

Q. And the Forge, and the "Little brick-factory?"

A. Yes, sir. That was upon the east side, near the bridge?

Q. And your father's factory was on the east side?

A. Yes, sir.

Q. So that all that which came to your father originally, his original deed, went to Mr. Mears', and was afterwards sold, part to Mr. Talbot, and part to your father? All these were on the east side?

A. Yes, sir.

Q. How much did your manufacturing establishment cost you?

A. \$125,000.

Q. How much is its present value, in your judgment? How

much will you sell it for in cash?

A. Manufacturing property now is a little unsettled. I think that property is so situated now that I think we could sell it for what it cost us.

Mr. Butler. I object to that. There are a great many things a man has got from his father that he would not sell at the market value.

- Q. Take the market value. What do you think it would sell for?
 - A. I think it would sell for \$125,000.

Q. What is your capital used with it?

A. Our books in January showed \$269,000 as working capital.

Q. Sometimes it is used and sometimes not all of it? A. It depends upon the condition of the business, sir.

Cross-examination.

Q. (By Mr. Butler). How long have you run your mills, in a dry time, by the present engine?

Mr. Abbott. I am going to put that in by the books that I told

you about.

Mr. Butler. I want to come to that now.

Q. I don't mean the exact number of days. How long, since you have been running your mill, have you run it in a dry time by the present engine?

A. The present engine was put in ten years since, — in 1866.

Q. What is the rated horse-power?

A. I am not able to say.

Q. About what?

A. I should have to take it from what I have heard others say, sir. I have not practical knowledge of the power of an engine; I should suppose in the neighborhood of 50 horse-power, from what I have heard.

Q. I suppose you want to put in a practically proper and good

engine, according to the best skill?

A. We have always managed to be as prudent as possible, and put it in at the lowest possible expense. Some seasons, not wanting it at all, we put in as small a one as we thought would be economical.

Q. Will you tell me what it cost?

A. I cannot tell you, sir; although I have seen the bill recently. It has passed from me. The engine was built at the Atlantic Works. I have a bill of it, and I happened to see it lately.

Q. Have you found any difficulty in running your mill from

your engine?

A. Yes, sir.

Q. How many sets of cards have you?

A. Seven.

Q. Flannels?

A. Yes, sir.

Q. About as heavy work as the ordinary woollen work?

A. Yes, sir.

Q. As the ordinary flannel work?

A. Yes, sir.

Q. Is not flannel work about as heavy as any woollen work?

A. Cassimere mills require more power per set. Q. And flannel less than blankets?

A. I don't know, sir, about that.

Q. At a rough estimate, sir, (we will get at it from the books directly) what portion of the time do you run your mill by steam?

A. It depends entirely upon the season, sir. Some seasons we have been two or three years without wanting steam a day, and then, again, in a dry season, we have had to run 60 or 70 or 80 days.

Q. How many years, within the last ten, have you not used

steam at all?

A. Three, certainly, sir, we have not used steam-power at all.

Q. Had you any engine in before that?

A. Yes, sir; previous to this engine we had a smaller one in; but that was for the old building. When that addition was built, we were obliged to put in a larger one.

Re-direct.

Q. (By Mr. Abbott.) You say you had seven sets of woollen machinery. How many sets is your room built for?

A. Eight sets.

Q. You have used seven for what time?

A. For ten years.

Q. Since the time you had this engine?

A. Yes, sir.

Q. You say you have had trouble. Has it been from your engine breaking down?

A. Yes, sir.

Q. Is that for the last two years?

A. Yes, sir.

Q. I understood you to say, in answer to Gen. Butler, that you were as economical as possible, and put in the smallest one possible?

A. Yes, sir; we went to the smallest possible expense that we could get along with always.

Q. Can you give us the cost of your engine? A. I cannot, without referring to the papers?

Q. Will you send it, and let me know? A. Yes, sir.

Q. (By Mr. BUTLER.) It was put in in 1860, then?

A. Yes, sir. All I can give you will be the bill, from the Atlantic works, of what it cost delivered at the station in Boston. The transportation, setting, etc., I have not got. I simply have what it cost us, delivered at the Lowell railroad.

Mr. Abbott. I put in now a memorandum made from the books (which books I will put in directly) of the time that steam was used each year. Mr. Faulkner wants to have the exact facts shown as they are. I am going to put in the books by the next witness, who kept two years of them.

The WITNESS. This paper which I now hand to the counsel, is an abstract I made from the time-books, and went over them very

carefully myself.

The paper presented by Mr. Faulkner was as follows:—

Memorandum of Days J. R. Faulkner & Co. have used Steam.

1865. In Aug., 19 days, and Sept., 15 days; for the year, 1866. Used no steam; water enough. 1867. 1868. 1869. In Sept., 2 days; Oct., 1 3 In Aug., 27; Sept., 26; Oct., 14; Nov., 2 69 ' 1870. In June, 9; July, 20; Aug., 27; Sept., 24; Oct. 9; 1871. Nov., 3 92 1872. In July, 9; Aug., 13 22

1874.	In June, 12; July, 25; Aug., 15½; Sept., 19; Oct. 5½. In Aug., 6; Sept., 25; Oct., 24; Nov., 24; Dec., 14. In June, 15; Feb. 21; March, 14; July, 2; Aug., 6	77 93
1070.	In Jan., 15; Feb., 21; March, 14; July, 2; Aug., 6 Sept., 10; Oct., 5	73
		162

1876. In June, 2; July, 26; Aug., 14; Sept.,

When the water failed, June 28th, 1876, we did not run the mill until we had water again, August 1st, that time. 28 days is included above.

Cross-examination, resumed.

Q. (By Mr. Butler.) I should like to ask you a few questions upon this paper. In 1866 you used no steam. You were rebuilding in that season, were you not?

A. Yes, sir, we built; but our mill did not stop at all in build-There were four sets in that building, and then we built on

a building in which were placed four sets more.

Q. In 1867, were you running full? A. Yes, sir.

Q. And in 1868?

A. Yes, sir. Q. In 1869 you had three days?

A. Three days only; two in September, and one in October. Q. In 1870 you had in August how many?

A. Twenty-seven days.
Q. And twenty-six in September?

A. Yes, sir; and fourteen in October, and two in November; making in all sixty-nine. In 1871, in June, nine days; July, twenty days; August, twenty-seven days; September, twenty-four days; October, nine days; and November, three days; making in all ninety-two.

Q. And in 1872 you had nine days in July, and thirteen in

August; making in all twenty-two?

A. Yes, sir.
Q. In 1873 you had seventy-seven days?

A. Yes, sir.

Q. In 1874 you had ninety-three days?

A. Yes, sir. In that year there was a dry winter, and we ran it in December.

Q. In 1875 you had seventy-three days?

A. Yes, sir.

Q. And in the present year, up to the present time, you have had how many?

A. In June, two days; in July, twenty-six; in August, fourteen; and in September, twenty-six.

Q. Have you any memorandum back of 1865?

A. I have not, sir.

Q. Was there any kept at the mill?A. There probably was, sir.

Q. It is in these books.

[No answer.]

Direct Examination, resumed.

Q. (By Mr. Abbott.) I want to ask you how you are enabled from the books to ascertain, away back to 1865, the number of

days? Explain it.

A. [Producing book.] There is the record, sir. [Explains the record to the counsel and the commissioners.] That runs all the way through those ten years. The abstract is taken from those books.

Mr. Abbott. One person acts as engineer and fireman, and whenever the engine is run there is a "dot" made, and he is paid extra for those days; and that system goes through the whole since 1865. There are those dots against this man's name every day that the engine is run. Faulkner says he has gone through it, and ascertained it for each year, and given in this abstract the number of days run in each month.

Q. Do you recollect ever having to run in the winter, except in

1865, in January and February?

A. I don't know. It is very unusual.

Mr. Abbott. Please send for any books you have at the mill which will show it previous to 1864.

Q. (By Commissioner Russell.) The winter you ran by steam

was December, 1874, and January, 1875?

A. Yes, sir.

Q. So that they worked from the 15th of December, every day

they did work, up to the 24th of February, by steam?

- A. Frequently there have been times that we did not think it expedient to produce all the goods we could in the mill; and that was one of the years. January, 1875, I presume the book will show that we were running three-fourths or two-thirds of the time, and let the engine run so many days in the week. Now, really to get at the time, all those days should be added which are blank, because if we had used it so much power would have been missing. But those days are skipped over because we were running threefourths or two-thirds of the time, as the case might be. Sometimes there have been two or three days in the week; sometimes we work four days and sometimes five, according to the quantity that we wished to produce. The number of days by steam would have been more, had business warranted our running all the time.
- Q. Do you remember whether your neighbor Talbot was in the same condition?

A. I don't know, sir.

Mr. Butler. The only value that I can see in this statement is, that it shows that they ran by steam just as much before we took the water as afterwards.

RICHARD FAULKNER, sworn.

Q. (By Mr. Abbott.) You are grandson of old Squire Faulkner?

A. Yes, sir.

- Q. For the last two years you have been superintendent of the mill?
 - A. Yes, sir.

Q. You kept this little book for the last two years? A. Yes, sir.

Q. What is the name of the fireman?

A. Michael McNulty.

Q. Explain the meaning of these "dots" against his name.

A. Whenever we ran by steam we "dotted" his time.

Q. For what reason?

A. We pay him extra pay for those days. That has been carried on during twelve years, and the book kept by myself. I found the books kept in the same way previously.

Q. The man who kept those books is where? A. Well, he is in the country — up in Vermont.

Cross-examination waived.

Mr. Abbott. Send us all the books you can find in the mill that have any such record.

Q. (By Mr. Abbott.) Was the record kept previous to that

time in the same way?

A. I think the record goes back in the same way to 1853.

Mr. Butler. I wish you would run over those books and make a calculation, the same as your father has done, say so much steam for every month in the year, and so many days, and send it down to-morrow morning.

Mr. Abbott. I believe that is all our testimony.

Mr. Butler. Have you completed that calculation I requested you to make, Mr. Holmes?

Mr. Edward O. Holmes. Yes, sir.

EDWARD O. HOLMES, recalled.

The Witness. I produce the calculation requested by General Butler, of the discharge of one gate, 16 × 16 — the grist-mill. It shows the amount discharged from the gate 16 × 16, under a 7. feet head, as 2,103.55 cubic feet per minute. It is as follows: (reads.)

Calculation by Edward O. Holmes of discharge of one gate.

"1 gate 16 by 16 = 256 square inches opening.

"256 × 9.13, being cubic feet discharged per square inch per minute, under 7½ feet head =

> $256 \times 9.13 = 2337.28$ $2337.28 \times .9 = 2103.55$

2103.552, being discharge from gate 16 by 16, under 7½ feet head, per minute."

256 9.13 768

256 2304

2337.28."

Mr. BUTLER. I want to put in the report of the commissioners on this river, from the "Report of the Joint Special Committee on Flowage," etc.

[Adjourned to Wednesday, October 4th, at 9.30 o'clock A.M., at which time the Commissioners met and further adjourned to Monday, October 9th, at 11.30 o'clock A.M.]

TESTIMONY OF WITNESSES TAKEN BEFORE A LEG-ISLATIVE COMMITTEE CONTAINED IN HOUSE DOCUMENT 100, IN THE YEAR 1860.

Jonathan Manning, being duly sworn, deposed, upon examination by Mr. Child, as follows:—

I reside in Littleton, and have resided there for fifty-seven years.

My age is eighty-four years.

I worked for the proprietors of the Middlesex Canal six summers and two winters, beginning in May, 1796, and ending in November, 1801. I helped build the locks on the Merrimack river, the bridges, sluices, and so forth. I worked at carpenter-work, almost wholly. In 1796 and 1797, I did not work on the dam. In 1798 I helped build the dam. There was a dam previously there, what some called a zig-zag dam, - leaky, and not very high. never knew the height of either dam, - to my knowledge. The dam I helped build was higher than the former one. They made rafts to bring timber from the Merrimack, and there was not water enough, by the old dam, to fill the canal. After the new dam was built, we took down wider rafts, - the canal being wider at top than bottom. The planks used were, I think, two and three-quarter inches in thickness. I never saw the old dam till I went to work, after the canal was fixed in. When there was a flush of water, the guard-gates were opened to fill it. No flash-boards were ever put on the old dam, to my knowledge. I have heard, from Mr. Baldwin, the Superintendent —

Mr. Butler objected.

Mr. Child argued for the admission of the testimony.

Witness said, in the course of the conversation, that he did not know that any advantage was taken of the spring freshets. Timber could then be better floated.

Objection having been taken to further testimony offered, Mr. Mellen argued that, before a Legislative Committee, the strict rules of evidence were not necessarily to be enforced, except at the discretion of the committee.

Mr. Butler insisted that, as the rights of the mill-owners were legal rights, they should be effected only by legal testimony. The committee would judge of the relevancy of testimony, but would not hear what could not be evidence.

The Chairman ruled that hearsay testimony was inadmissable. Witness. I recollect that a boat passed up that part of the canal between Concord and Merrimack rivers, with a party from Boston, or Medford, or somewhere.

Q. Who composed the party?

A. I know but two or three men. There was one from Boston, Judge Sullivan, the president of the canal, and old Col. Baldwin and one of his sons. I do not remember many others, nor how many there were, but I should think, twenty, twenty-five, or thirty.

[Witness proceeded to speak of information received, at the time, by heresay, in reference to the raising of the water in the canal, to float the boat. Objection was made, and the testimony rejected as

incompetent.

I do not know how much higher the new dam was than the old; but, — from their raising the water in the canal so much higher than before, — I should think, nine to twelve inches high. After taking the water down six inches, I remember, in the first of June, or the last of May, seeing the gates open. I should think the effect on the depth of the water, of the completion of the new dam would be that they could raise it nine inches or a foot. So I have thought sometimes, by the flowing of the water after they got the dam built, — it flowing up higher into a yard where we worked, and sending us back into higher land. I thought the water was much higher, but I couldn't say. I cannot tell how much water there was in the canal before we built the new dam; I should say there was something like two and a half feet of water when the boat came up. I cannot tell what depth of water the canal required, in order to be full; but I think, three and a half feet. That is my impression; I am not positive, — I think it is correct.

The dam I helped build had a bridge over the stream, the dam below being built so that the water should go over it. There was a little island, and a saw-mill stood on that. The main dam crossed the river; and where the water ran over was what is called a figure-dam. We had a gauge to make it by; and it was put up—I don't know how far apart—I should say, eight feet across the piers, and then stringers locked right on at the side; and then it was planked, slanting up the stream. This was a figure-four.

There was a cap-sill put on to this dam.

The figure was like this: -



After the dam was built, timber, principally, was brought down. The timber and rafts were larger than before. The small was tim-

ber for locks: the large, sawed for planking. I think they were much larger. I think I saw one log from which seven planks were

sawed, with two slabs.

I saw that dam in 1832 or '33, or about then. There was a stone dam built below it, which covered it up. I then saw the posts of the waste-gate, but they were under water — the tops a little under. They had been built all of a foot higher than the dam. There was a sluice-way for fish to go up, planked the other way. That was lower than the dam. It was kept open every spring. Don't know when it was stopped.

Mr. Butler. That was all matter of legislation.

Flash-boards were put on the dam I built, before I left; — I don't know when, or by whom. Saw them there the two last years. They said they were ten inches high. I have no judgment about their height. I did not work there much, the last two years.

That section of the canal between the rivers was finished in the

fall of 1797, when Sullivan's boat came up.

Previous to the building of the dam of 1798, there was a pond there, and a mill. It was called a pond. It was there when I was a boy, and went to mill there. The old dam flowed not nearly so high as that I helped build; — I cannot say how much lower.

I frequently conversed with men at work at Mr. Rogers'. Never

saw the ledge, that I know of.

The flash board was put on to the dam by little posts put up, and a brace. They didn't appear to be fastened. There was no capsill but that on which the planking was nailed. What of the dam was below the bridge was such as to have the water go over.

NATHAN BARRETT called and sworn. Examined by Mr. Child.

I live in Concord. I am sixty-three years of age. I live on a height where I can see the river for two miles. I have always lived there.

I am owner of river-meadows, as was my father. I own meadowland on one side, and upland on the other. I own three hundred or four hundred acres, mostly on the river. There is much woodland. There is one piece of ten acres, in front of my house, the highest in Concord. I own ten acres below, lower, and five acres below, still lower. I owned some below, in Carlisle, which I sold in 1829. My father bought it. Value it at \$35 an acre. He owned it ten to fifteen years. I kept it about three years, and then sold it for \$10 an acre. It grew wetter. The hay was good meadow-hay; it got into water-grass. It was good, common meadow-grass. The river came up higher, about 1826 or '27, and has been higher since. It is moved now. It is in a range of meadows. The water, of late years, has got to a certain height and is more stationary; that keeps the meadows wet. It gets even with the banks, but not low enough to make it dry. We used to go on with teams. The last time I got hay there, I poled it off. On that range of meadows the grass, as long ago as I can remember, was very good. At some places on the bank, red-top grew. There

was some scratch-grass—good meadow-grass. I wouldn't now go after it—two miles—on the meadow I sold, if given to my. Some

seasons, we used to have to pole it.

The water is higher now than in 1828. I measured the river in four places in 1835, and also last year. In three places I made it ten to twelve inches, at the lowest time, higher this year than in 1835. I have, at home, the minutes taken before 1828. In 1835 I had the measure of how much it had fallen from ploughing out the bar. The measures, —I now know, —compared with those of this year, were those before 1828. I measured by two stones, one at the upper side of the bridge — what was the old North Bridge, moved down —and one on the lower side. I measured down at my fordway, at the bridge, and both sides of the bridge. Before 1828, these stones were above the surface at very low water. This year, the water, at the lowest, was 17 inches above. Another stone, formerly above water, was, this year, a foot below the surface. I measured by the timber of the bridge, also.

The fordway is about one hundred and fifty rods from the bridge. Barrett's Bar is the lowest bar towards the dam. It is about thirty or forty rods long. It is made of sand. It changes every Winter. It hardly ever freezes, there. When a boy of twelve, I have crossed the bar without wetting my knees. In September, 1835, a man from Billerica asked me to have some of my men at work on the bar. They ploughed and scraped out, three or four days. They made the channel on the South side, and it has always remained so. They went down, in some places, eighteen inches. At this time, I made the mark at the bridge — probably before they commenced. The second day, the water had fallen one inch. The next, it rose two inches. The next, it fell one inch. I remember

no other attempt to clear this bar.

When I was a boy, grass grew in the river — quite a little island, in the middle. It wore away, a good many years ago. Since the water has been kept so high, it has worn away; — most of it has been gone for thirty-five or forty years. Used to cut six to eight cocks of hay a year there. It is, there, a foot higher than before 1828. I have not seen any grass in the river till this season, when I saw a man on dry land in the middle of the river. There used to be a ford-way. I have not crossed, except with an empty wagon, for several years. It is lower this year than for two or three years. It was lowest some time in August. This time was just before the Committee came. There was a man there making marks for some purpose. I only took it by my eye, that it was then lowest. The river went down, I thought, sooner than usual. I know of nothing done at the dam, to cause the fall. The water is at least a foot higher than thirty years ago.

I measured opposite my land, by a wall, two feet high, which my father built, and which has been covered almost all this season. This is one hundred and fifty rods, or more, from the bridge.

The timber has not been out of water since 1828. I don't

remember measuring it since then.

The chief part of great meadows is below the bar.

DAVID HEARD recalled. Examined by Mr. Mellen.

I have, at times moved grass in the stream. I was one of the Directors of the Sudbury Meadow-Owners' Corporation, formed in 1816. There was a clearing of the meadows — some years after - mostly. There had been a law-suit, and something said about the weeds; and we thought we would try it. We had two instruments. We used to work, and clear it. I have worked upon all the bars, I guess, from the Concord line, as far as any were worked upon. The principal bars are all hard gravel-pans, in the bed of the river. There were not large deposits upon them, - just enough to start out a weed, which would grow according to the depth of the water. We used to rake them out. A shovel instrument was used, to take out the weeds in deep water, above the bars. That was kept up for a number of years. After 1828, there was quite a change in the stream, and the labor expended after that, seemed to be lost. It was continued up to 1828; and after that there was a change in the river; the water in the river stood higher. The low-water marks stood higher, and continued so. Where we used to drive our teams, it was impossible to go with them; and we used to take boats, after that, with two or three men in, along side, fasten to a long pole, or something of that kind, and mow the weeds and let them float. A considerable sum of money was expended by the corporation. After 1833, suits were brought against the Mill Corporations; and the taxes after that were principally for defraying the expenses of those suits. I think I looked over the books, once, to see what amount was probably There was quite an amount—I think, over a thousand laid out. dollars, for clearing the river, from the commencement, - after 1816, — to 1828. It was continued afterwards. The water took a higher stand at low-water - which was the grade of water we chose, to operate upon the river. And after that, we did not undertake to go on with teams. What was done was done by plunging into the higher part of the bars, or hiring men to go, or taking boats and working as I have described.

There were extreme points of low-water mark, lower than it is now. I think I have seen it two feet lower than it has been this season. There was a time, previous to 1828, when the water would go down to a certain low point, and then the water would come in above, and raise it up. I have seen the operation of the river at Farm bridge, where the water was shut up above us; the water would fall, from Saturday to Monday morning, an inch or two. By Tuesday night it would come back—sometimes not, but, as a general thing, it was as high. That we called a low state of water. That same operation came upon this water, after a higher grade was produced, at a low state, and when there had been a series of dry times. I think the difference was in the neighborhood of two feet higher than previous to—say—from 1816, when my attention was very particularly called to the river.

Upon my meadows, it is two feet higher than before, at low-water mark. It has submerged my meadows, with one or two excep-

tions. I have not considered the hay worth cutting. I would give it to anybody, if they wanted to go for it as a general thing. I cannot say but there have been some exceptions. The water, now, in cases of flood, compares, in passing off, with former years, thus: the water goes down to a certain grade—not quite as fast as it used to, but it goes down to a certain grade,—and becomes stationary; whereas it used to go off, to below—well, it would vary as the season was, and as the cause producing the water upon the meadows—I have known it to go down three inches in eight-and-forty hours—but as a general thing, you could calculate that when water was on the meadows three inches, it would go down

two inches in a day.

Bridle-point Bar has changed like all the rest of the river. Since my father died, in 1813, — from that time to 1828, — that Bridlepoint road was not made. There were many owners of meadows in the vicinity of my place in Wayland. They had to go around on the old causeway, and go around to the head of the meadows, to get on. That was the only way they had go, lawfully, unless they boated across the river. But I have given permission, many times, to people, my neighbors, and persons who had bought hav in those lots, to ford the river at Bridle Point, and go on to my meadow and so travel up the brook. Their mode of getting it was by poling it across. They loaded up, and came back the same way they came on on. They poled it across West Brook, on to my meadow, which is on the west side of the river, from Bridle-point Bridge, and on the side of the brook. These meadows were on the west side of the river, and on the other side of the brook - the north side. The water on that bar would depend upon many conditions. The meadow swere dry — the banks were perfectly dry. And when the banks and meadows were perfectly dry, the water was not very deep on the bed of the river, at that place. I forded across, several times, for water. There was a beautiful spring between the river and the road, for which they used to cross the river in having-time. I have not seen a team go across, or person wade across, since 1828. Previous to that, when I turned my cattle on that meadew for fall feed, I used to have to put up a fence there, to keep them from going across. To tell its depth would be mere guess. I should judge it might measure three feet deep, there.

The whole of these bars were solid bars, with but litte sediment, It was mere weeds, that we could drive out; as soon as disturbed, they would float. But above the bars, where the bottom merged off into deep water, there would be deposits, which we got off with a scraper. It would usually wash out before we got to shore. Mr. Draper invented a horizontal wheel, fixed some knives upon it, and we undertook to run through some bars. It did not operate well. It got clogged. I know all the bars.

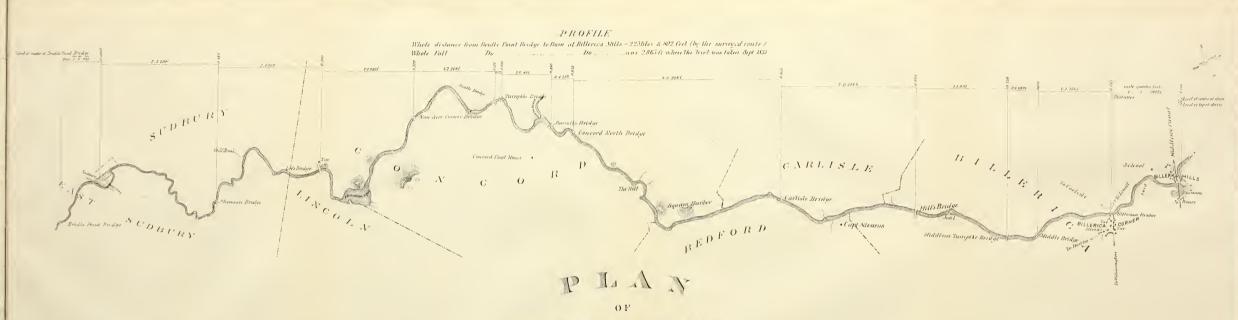
Perhaps the river has been growing more sluggish of late years. The weeds have extended, upon these deposits above the bar. But those weeds, when the committee were going down, were in a state of decomposition, with slime all upon the stems. The next night, it rose. Within three days after that, I went to Sudbury. Judge

Mellen and I passed over the canal bridge. I drew his attention to the appearance of the weeds in the canal. They had nearly all disappeared. The current had been quickened a little, and the weeds, in that decomposed state, drifted off.

Q. About this dam?

A. I was one of the Directors. Col. Wm. Baldwin was a Director. I could not fix the time. At any rate, there was a considerable flood upon our grass, and Col. Baldwin and I concluded to go to Billerica, to see about it. It was one of those years in which Mr. Baldwin was Agent, or Superintendent, he running a packet. He was on board a packet, and I understood that he ran one from Chelmsford to Boston. He was Agent, at any rate, of the Canal. We referred to him as such. I conversed with him. In consequence of that interview, Mr. Baldwin and myself obtained some other help, and hoisted — I think it was — three gates. This old dam of 1798 had two sluice-ways. There was a gate at the West end, and one nearly in the centre of the stream. There was one of the gates we could not get at. But we got up two of them and let the water run, that day, while we stayed there. The water was then running over the dam, in pretty large volumes — a sheet. The water went down, while I was there, so that I could see the old dam. I mean the old '98 dam. The gates were built with plank, fastened together, and a long plank in the centre, which came up several feet higher than the top of the dam, with mortice holes, and iron rings across, and, laying a timber across this frame, we could get this lever in, and pry the gates up. I recollect, very distinctly, the form of the dam. After we drew the water from the top of the dam, some little distance, it showed itself that I could examine it. I walked across, on the lower side, after the water had done running over. There were large rocks I could stand on, and see below.

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TO ACCOMPANY REPORT OF HEARING ON THE

CONCORD AND SUDBURY MEADOWS

Introduced by Petitioners

द्वभद्वयव स्थित्रहार

FROM EAST SUDBURY TO BILLERICA MILLS.

22.15 Miles,

TO BE USED ON A TRIAL IN THE S. J. COURT.

SUDBURY AND EAST SUDBURY MEADOW CORPORATION

VS.

MIDDLESEX CANAL.

Taken by agreement of parties,

WY

L.BALDWIN, Civil Engineer,

Richards Inh 414 Wash "St

SURVEYED AND DRAWN

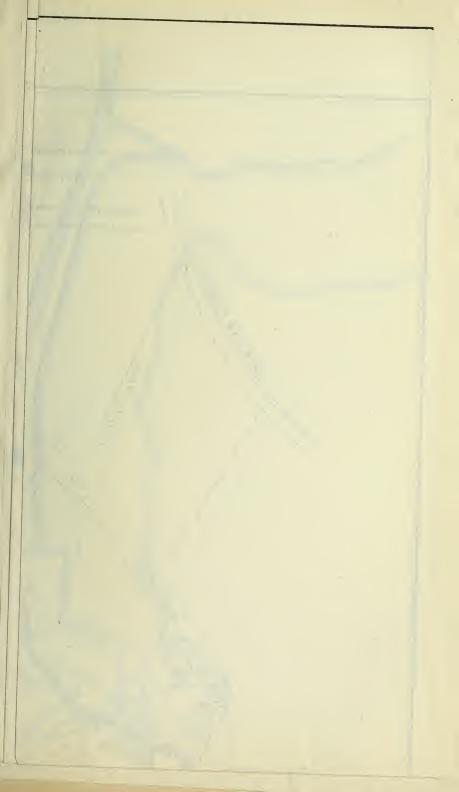
bv

B.F. PERHAM,

May, 183 k

Reduced 45 from Original.







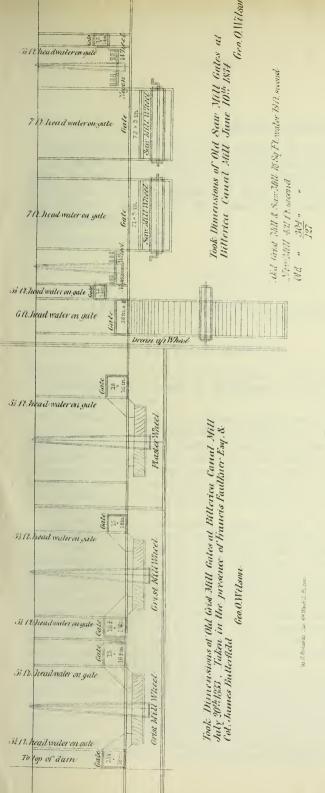


PLATE V.

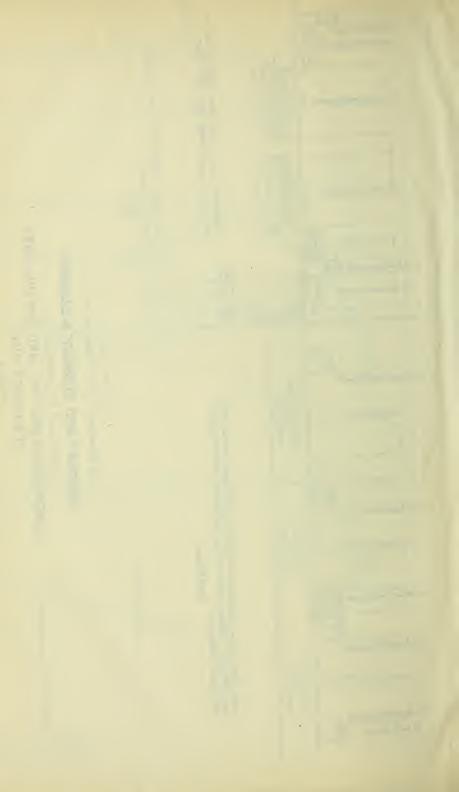
To accompany Report of Heaving on

CONCORD AND SUDBURY MEADOWS

(Introduced by Respondents)

(Reduced of from original)

DIMENSIONS OF GRIST MILL AND SAW MILL GATES
AT BILLERICA MILLS
1833-4



Monday, October 9, 1876.

The commissioners met at $11\frac{1}{2}$ o'clock, A. M.

Mr. Butler puts in Map No. 1, in House Document No. 100 (viz., the report of the joint special committee on flowage, etc.); also, Map No. 2 from the same, and the accompanying exhibits; also, Maps No. 3 and No. 4 and 5 from the same document.

[Testimony closed.]

JAMES R. FAULKNER, PETITIONER,

vs.

CITY OF BOSTON.

To the Honorable the Justices of the Superior Court, now sitting at Cambridge, in the County of Middlesex, in the Commonwealth of Massachusetts:—

The petition of James R. Faulkner, of Billerica, in said County of Middlesex, and Charles Faulkner, of Boston, in the County of Suffolk and said Commonwealth, respectfully represent unto your Honors said petitioners, that they own, are seized of in fee and possessed of, and have for more than three years last past, certain parcels of lands, and the buildings thereon situate, in the northern part of Billerica, in said County of Middlesex, bounded and described as follows:—

First Parcel. A certain piece or parcel of land, with the brick factory and buildings thereon standing, situated in the northerly part of said Billerica, bounded as follows, viz.: beginning at the road, which passes in front of said factory, at the corner of said James R. Faulkner's lot, and running northerly on said Faulkner's land until it comes parallel with the front of his dwelling-house; thence westerly three hundred feet to a stake and stones; thence southerly one hundred and forty feet to a stake and stones; at a little basin, so called, in Concord river; thence easterly, on the south side of said Factory creek, and on land of Nathaniel Stearns, now or formerly, to the road above mentioned; thence on said road to the bounds first mentioned.

Second Parcel. Also, a certain other lot of land, with a wooden factory thereon standing, situate nearly opposite the brick factory aforesaid, being the same premises conveyed to Francis Faulkner by Nathaniel Stearns and John Baldwin, guardians, by their deed bearing date on the twenty-ninth day of April, A. D. 1831, recorded in the Middlesex Registry of Deeds, book 305, page 44.

Third Parcel. Also, a certain other lot of land near the above,

and near the bridge over Concord river, with the buildings thereon, called and known by the name of "The Blacksmith's Forge and Iron Works," being the premises first described in the deed, by which Abner Kneeland, guardian, conveyed the same to said Francis Faulkner, dated the twenty-fourth day of May, 1836,

Middlesex Deeds, book 53, page 514.

Fourth Parcel. Also, a certain other parcel of land near the above, bounded and described as follows, viz.: beginning at a stake on the road leading from Tewksbury to the Canal Mills, formerly so called, at the intersection of the line of said road. and the strip of land in common on the easterly side of the forge lot, so called; thence north 401° west, four rods one and onequarter links by said strip of common land; thence south 51° west, seven rods and thirteen links to a stake; thence north 812° west, six rods twelve and one-half links across the little basin, so called, to a stake at land owned by the heirs of the late Francis Faulkner; thence north 513° east by said Faulkner's heirs' land, eleven rods and three links to a stake; thence north 732° east by said heirs' land two rods thirteen and a half links to a stake; thence south 85° east by said heirs' land two rods and fourteen links to a stake; thence south 70° east by said heirs' land three rods and nine links to a stake; thence south 261° east by said heirs' land three rods fourteen and one-third links to a stake at said road; thence south 563° west by said road four rods and seven links to the point of beginning. Also, all the interest formerly held by Chas. P. Talbot and Thomas Talbot in a small strip of land, four feet wide, adjoining said last-named parcel, and which was used by said Talbots and the petitioners as common land up to the eighth day, 1857, with the exception of such rights as are reserved to said Talbots in their deed of said date to these petitioners, recorded in Middlesex, North District Deeds, book 9, page 378.

Fifth Parcel. Also, another parcel of land situate in the north part of said Billerica, viz.: beginning at the southwest corner of land owned by said James R. and Charles Faulkner, and running easterly by their land one hundred and forty feet, south, sixty-four feet by land of said James R. and William E. Faulkner, making two hundred and four feet; then running northerly on land of said William E. Faulkner one hundred and four feet; then running westerly on land of said William E. Faulkner two hundred and seven feet to land of said James R. and Charles; then running southerly on land of said James R. and Charles one hundred and four feet to bound first mentioned, said William E. Faulkner hereby reserving to himself, his heirs and assigns, a right of way or road across the above-described and granted parcel

of land to land of said William E. adjoining.

Sixth Parcel. All that tract of land, with the buildings now standing thereon, situate, lying and being in the northerly part of said Billerica, and bounded and described as following: beginning at the northwesterly corner of the premises hereby conveyed at the junction of two roads leading from North Billerica, so called, one to Billerica Centre, and sometimes called Mill street, and the

other to Tewksbury, and sometimes called North street; thence running south 16° east 7½ rods on said Mill street; thence south $27\frac{1}{4}^{\circ}$ east, 4 rods to said Mill street; thence south 16° east, 4 rods by said Mill street; thence south 2° east, $12\frac{1}{100}$ rods by said Mill street to a barn or building on said premises; thence westerly by said building $\frac{80}{100}$ of a rod; thence south $1\frac{4}{4}$ ° east, $3\frac{44}{100}$ rods by said Mill street; thence south 7° east, $5\frac{92}{100}$ rods by said Mill street; thence south 9° east, $7\frac{32}{100}$ rods; thence turning by a curve of $_{100}^{75}$ of a rod and running south 80° east, $16\frac{68}{100}$ rod; thence south 66° east, 25,80 rods to the Boston and Lowell Railroad; thence northwesterly by said railroad 72 rods, more or less, to said road leading to Tewksbury, called North street; thence southwesterly by said North street 14 rods, more or less, to the point of beginning; containing 6 acres and 95 square rods. Also a certain other tract of land opposite the tract above described, and situate upon the westerly side of said Mill street, and bounded and described as follows: beginning at a point on the westerly side of said Mill street, opposite the point of beginning of said tract hereinafter described; thence running southeasterly in a straight line 12 rods, more or less, to Concord river; thence running south 30° east, by said Concord river, to a great rock; thence nearly southerly by said river to Willow Tree, or what was formerly the Middlesex Canal; thence southeasterly by said canal 9 rods and 25 of a rod to said Mill street; thence northwesterly and northerly by said Mill street to the point of beginning; containing 1 acre and 130 square rods.

Seventh Parcel. The following described parcels of land, situate in said Billerica, bounded as follows, viz.: the first piece, beginning at the southwest corner thereof, on the road leading from North Billerica mills to the corner of the town; thence running northerly 343 rods, more or less, on land of James Faulkner to land of James R. Faulkner & Co.; thence running easterly 64 feet, more or less, on said land of James R. Faulkner & Co. to other land formerly of said William E., when living; thence running southerly on said last-named piece of land 343 feet, more or less, to the said road; thence running westerly on said road 48 feet, more or less, to the point of beginning; containing about one-half acre, more or less, with the dwelling-house thereon. The second piece, beginning at the southeast corner of said first piece, on said road, and running northerly 548 feet, more or less, on said first piece and the said land of James R. Faulkner & Co.; thence turning and running westerly 210 feet, more or less, on land of James R. Faulkner & Co.; thence turning and running northerly again 545 feet, more or less, on land of James R. Faulkner & Co., to land of Jones, Haynes & Foster; thence turning and running easterly 423 feet, more or less, on said last-named land; then turning and running southerly 791 feet, more or less, on land of the Boston and Lowell Railroad; then turning and running westerly 116 feet, more or less, and southerly 201 feet, more or less, on land of C. P. Talbot & Co., to the road leading to the depot of the Boston and Lowell railroad; then running southwesterly 288 feet, more or less, on said last-named road, to the point of beginning,

and containing 6 acres, more or less. The third piece, beginning on the first-named road at the corner thereof, with the road running to the depot and running on the depot easterly 302 feet, more or less; then turning and running 75 feet, more or less, southerly, 50 feet, more or less, easterly, and 65 feet, more or less, southerly again, on land of said railroad; then turning and running 208 feet, more or less, on the road leading from the mills of Tewksbury; then running 258 feet, more or less, on the road from North Billerica Mills to the centre of the town to the bounds first men-Your petitioners further tioned; containing 2 acres, more or less. say, that they are the owners and proprietors of certain valuable water-rights, water and mill privileges, arising from and formed by the said Concord river, and appurtenant to the real estate above described, and of the right to use the waters of said river for all legal purposes at their said property in said Billerica, and that they have been such owners and proprietors of said valuable water-rights, water and mill privileges, and right to use water of said Concord river for three years last past and And your petitioners further say that during all said period of three years last past and longer, that they have the right, and for more than three years last past have had the right, that said Concord river should flow in the same manner and in the same quantity, volume and force, and within the same limits, channel and bed as said river did at the time of the action of the City of Boston, hereinafter set forth, and as said river had from time immemorial prior thereto, and that the waters thereof should continue to flow by and through their lands, mills and factories in its ancient and accustomed natural channel and bed, and over your petitioners' dam and through the artificial streams and sluiceways in their land, and over and through their water-wheels. And your petitioners further say that during all said period of three years past and longer, they have been the owners of water-mills, factories, and other works connected therewith, and used in the carrying on of their business on said parcels of land in the manufacture of woollen materials and flannels, run and operated by water-power derived and obtained by them from the waters flowing in and along the channel of said Concord fiver, and from canals, artificial streams and sluiceways from said Concord river through the lands of your petitioners aforesaid. And your petitioners further say that the Sudbury river, so called, in said Commonwealth, is one of the natural sources and tributaries of said Concord river, and that the waters thereof are one and the principal means of supply of said Concord river, and that the waters of said Sudbury river, when undisturbed and unobstructed and left to their natural course and current, flow into the said Concord river above the lands, mills and factories of your petitioners before described, and through and by means of the said Concord river, naturally flow and pass by and through the lands, mills and factories of your petitioners and furnish power for running and operating the same, and all of great value and advantage to your petitioners. And your petitioners further represent that by virtue of an act of the Legislature of the Commonwealth of Massachusetts, entitled "an act to authorize the City of Boston to obtain an additional supply of pure water," approved the eighth day of April, A. D. 1872, and numbered one hundred and seventy-seven of the acts of said year, the said City of Boston, in the said County of Suffolk, has within three years last past before the date of this petition, first actually taken through the agency pointed out in said act, all the waters of Sudbury river, and all the water in Farm pond, so called, and of the streams and tributaries, whether natural or artificial, flowing into them and connecting them at and above the dam and permanent obstructions, built by the said City of Boston, A. D. 1872, five hundred feet, more or less, below the crossing of said Sudbury river by the Boston, Clinton and Fitchburg Railroad, in the town of Framingham, in the County of Middlesex, and near and below the brook, which is the outlet of said Farm pond into said Sudbury river, and still continues and maintains the said taking and said dam and permanent obstructions, and has withdrawn and diverted the said waters from their natural and accustomed flow into the said Concord river, and by and through the channel and bed thereof, to and through the lands, mills and factories of your petitioners, and has altered and changed the natural current and course of said Sudbury river, so that the waters thereof and of Farm pond no longer contribute to or flow into said Concord river, and have ceased through and by the bed and channel of said Concord river, to reach, pass by and through the lands, mills and factories of your petitioners, and will not and cannot flow through the channel and bed of said Concord river, and by and through the lands, mills, and factories of your petitioners aforesaid, as they, your petitioners, have the right they should, and as said waters would now, and would hereafter continue to do, but for the action aforesaid of said City of Boston. And your petitioners further say, that by means of said permanent obstructions of the natural flow, current and course of the waters of said Sudbury river and Farm pond, and taking, withdrawal and diverting thereof, as aforesaid, from their natural and accustomed flow, and by means and reason also of the said permanent obstructions, dams and erections, which the said City of Boston has built and erected, as aforesaid, and still maintains, the waters of Sudbury river and Farm pond do not and cannot now, or never hereafter, flow as they did, and would naturally, into the said Concord river by, to and through the lands, mills and factories of your petitioners, and the natural flow and stream of said Concord river, through and by a channel and bed, and by and through the lands, mills and factories of your petitioners has been greatly reduced and lessened in quantity, volume and force, and thereby and by reason thereof, said petitioners are deprived of a large part of their water-power, water and mill privileges, and water-rights aforesaid, and that the same are permanently injured and destroyed, and the same and their lands, mills, factories and other works in the premises are greatly damaged and lessened in value; and your petitioners further say, that by said taking of the waters of Sudbury river and Farm pond, and by the said city's acceptance of the powers and privileges conferred upon it, they have sustained great

damages in their property, and that they have not, and have not been able to agree with the said City of Boston upon the damages to be paid them therefor, and that said city has not offered to pay them, as such damages, any sum whatever. Wherefore your petitioners pray and petition this Honorable Court for the assessment of their damages from the said taking of the waters of said Sudbury river and Farm pond, conformably to law, and that after due notice and summons to said City of Boston, this Honorable Court will appoint, upon the default or hearing of said City of Boston, three judicious and disinterested freeholders of this Commonwealth, who shall assess such damages according to law and that all such and other proceedings in the case as to law and justice shall appertain.

JAMES R. FAULKNER, CHARLES FAULKNER.

Boston, A. D. 1875. Filed May 31, 1875.

COMMONWEALTH OF MASSACHUSETTS.

MIDDLESEX, SS.

[L. s.] To the Sheriffs of our several counties or their Deputies.

GREETING:

We command you to summon the City of Boston, a municipal corporation established under the laws of this Commonwealth, in the County of Suffolk, to appear before the justices of our Superior Court, to be holden at Cambridge within and for our County of Middlesex, on the first Monday of June next, to wit, at an adjournment thereof at said Cambridge, on the twelfth day of July, A.D. 1875, and answer to the petition of James R. Faulkner of Billerica, in said County of Middlesex, and Charles Faulkner, of said Boston, filed in the office of the clerk of the Courts for said County of Middlesex, on the day of the date hereof, a true and attested copy of which petition is hereto annexed. And have you there this writ with your doings thereon.

Witness, Lincoln F. Brigham, Esquire, at Cambridge, this thirty-first day of May, one thousand eight hundred and seventy-five.

JOHN J. SAWYER,

Assistant Clerk.

OFFICER'S RETURN.

Suffolk, ss.

Boston, June 9, 1875.

By virtue hereof I, this day summoned the within-named City of Boston to appear and answer at Court, by giving in hand attested copies of this writ and of the petition annexed, to Charles H. Dennie, Esq., Treasurer, and Samuel F. McCleary, Esq., Clerk of said City of Boston.

Service and travel, \$1.28 Copies. 12 00

\$13.28

BENJAMIN F. BAYLEY,

Deputy Sheriff.

COMMONWEALTH OF MASSACHUSETTS.

Middlesex, ss.

FAULKNERS, PETITIONERS FOR DAMAGES AGAINST THE CITY OF BOSTON.

1. And now come said City of Boston, and for answer to the allegations of said petitioners say, that they admit it to be true, as therein averred, that the petitioners were in possession of the land therein described at the times therein set forth, but said defendants deny that the petitioners were the lawful owners of the water-power therein described, and require them to make such proof, as they are advised, of the ownership of such water-power on the Concord river.

2. And the defendants, further answering, admit that the Sudbury river is one of the branches and tributaries of said Concord river, and the waters thereof, and the streams running into the same would naturally flow into said Concord river, and flow into and make a part of a head of water raised by a dam at

Billerica, as set forth in said Faulkners' petition.

3. The defendants, further answering, aver that said Faulkners do not own any rights in said water-power, except it may be certain indefinite rights in common with other parties who have suffered damages jointly with them, if any, by the alleged taking, or any taking of the water of Sudbury river by the City of Boston, and the defendants claim that this petition for damages for the taking of the water of the Sudbury river by said Boston, under and by virtue of the act of the Legislature, as set out in the petition, should have been brought by the petitioners jointly with Charles P. Talbot, Thomas Talbot, of said Billerica, and others to the defendants unknown, who claim to own rights in said water-power, subject to certain rights, reservations and conditions therein to the town of Billerica, who are all jointly owners, or jointly interested in common, and not in severalty in said water-power with said petitioners; and said petition of said Faulkners, if it may be sustained at all, should be jointly with the other owners, in common of said waters and water-power, who claim damages against said city, because of the taking of said water, and not severally by each, because the defendants say that the water-power of said Concord river, at said Billerica, being undivided, it would be exceedingly burdensome and expensive to said defendants to be called upon to divide and show how the taking of said water of Sudbury river would affect the owners and claimants of the water severally, so as to protect themselves against the several claims of each owner therein. And they therefore pray the Court that the petition may be dismissed for non-joinder of the other owners of said waterpower, or that all of the owners of any rights in said water-power, created by said dam at said Billerica, may be ordered to come in and join as parties in said petition, so that there shall be but one assessment of damages for one act of taking by said city of said

water, and a joint injury thereby to said water-power owned by the

parties aforesaid at said Billerica.

4. And the defendants, further answering, deny that they have taken and diverted and withdrawn any of the waters of Sudbury river before the filing of said petition under the authority conferred by said act, set forth in said petition, in the manner and form therein set forth, or otherwise by said city acting under and by

virtue of the authority of said act.

5. And the defendants, further answering, say that said petitioners, and the owners of said water-power at said Billerica, on the Concord river, are not, and will not be damnified by the taking of the water of Sudbury river under said act, nor do they have any right therein or thereto, because they say that by the act of the General Court of Massachusetts, passed June 22, 1793, to which, with the acts additional thereto, the defendants beg leave to refer as part of their answer, certain persons therein named were incorporated by the name of the "Proprietors of the Middlesex Canal," as a perpetual corporation for the sole object of uniting the waters of the Medford river in said Middlesex county, with the waters of the Medford river in said county, by cutting a canal for that purpose, "provided that whereas it may be necessary in the prosecution of the foregoing business that the property of private persons may, as in the case of highways, be appropriated to public use."

It was also enacted therein that in the case wherein any person shall be damaged in his property by said proprietors in any manner, if said proprietors do not make or tender reasonable satisfaction to the acceptance of the persons damaged by them, such persons may apply within one year for a committee to estimate the damages so done; and such proceedings shall be had, that a committee should be appointed to estimate the damages and make return thereof to the next Court of General Sessions of the Peace, and that execution should issue thereon with a right of appeal to a jury for an increase of said damages.

And the jury or committee, as the case might be, were empowered to give either a sum in gross for damages, or annual damages during the continuance of said damage, and the party injured was to have

judgment and execution thereon.

And it was also further enacted that the proprietors were authorized and empowered to purchase and hold to themselves and their successors forever, so much land and real estate as may be necessary for the purpose aforesaid, not exceeding the value of £5,000; "provided that no water-course shall be turned or altered, where any mill is erected, so as to injure such mill, without license therefor, first had and obtained from the General Sessions of the Peace in the county through which said water-course may pass. And that the said Court, on application made to it by said proprietors, shall observe the same rules as are now prescribed by law when application is made to them for granting a public highway."

And the defendants further say that by an act in addition to the act above referred to, passed on the 28th day of February in the year 1795, it was enacted that "the property of said proprietors

in said canal, and in any other canal connected therewith which they shall effect pursuant to the authority of the government, and all real estate of said corporation of which the said corporation shall be seized, shall be divided into eight hundred shares," which were to be personal property for certain purposes; and it was further therein enacted by the second section of said act "that said corporation shall have power to receive and hold real estate as appendent to said canal, and for the purpose of facilitating its business, to the sum of £30,000, over and above the value of the canal itself, simply considered;" and they were further empowered to make the waters of the Concord river boatable as far as Sudbury causeway, and as much further as the same can be usefully improved for that end; and to open any canal at any place in said County of Middlesex that may be necessary to connect the Concord river with said canal for that purpose, and that the proprietors shall be liable to have damages recovered against them by any individual who shall be injured or damnified in his property in such new canal, by the same mode of process and the same manner as is in the same act provided.

And said defendants, further answering, say that, under said act of incorporation, surveys being made, it was found that it was impossible, without great and inordinate expense, to take the waters of the Merrimack river through a canal to unite with the waters of the Medford river near Boston, because it appeared that the waters of said Merrimack river, at a point where they were to come into said canal, were some twenty or more feet lower than the waters of the Concord river at said Billerica, at the point

where the said canal must pass the same.

And the defendants, further answering, say, that by an act, in addition to the several acts respecting the proprietors of the Middlesex Canal, passed June 25, 1798, it appears that "whereas by an act passed February 28th, 1795, it is provided and enacted that the corporation of the said Middlesex Canal shall be empowered to hold real estate, as appendent to said canal, for the purpose of facilitating the business of the same, to the value of £30,000 over and above the value of the canal itself. And the proprietors of said canal, having expressed their doubts whether in virtue of said act they may erect and hold mills on the same canal, and on the waters with which it is or shall be connected; it is enacted that the corporation of the Middlesex Canal, or the proprietors of said canal, in their corporate capacity, shall be empowered to purchase and hold any mill seats on the waters connected with the same canal, and lands to accommodate the same, and thereon to erect mills."

And the defendants, further answering, say, that by an act, in addition to the several acts passed respecting the Middlesex Canal, passed January 26, 1800, it is recited "that the proprietors of the canal have in their petition set forth that from a reservation in the acts already passed in their favor, the government has a right to regulate the toll of goods carried on the canal anew after the expiration of forty years, from which provisions great discouragements and embarrassments have resulted in the execution of that project;

therefore be it enacted that a toll of one-sixteenth part of a dollar for each ton carried one mile on the same canal be established for

said proprietors and their successors forever."

And that afterwards, by an act, in addition to the acts incorporating the proprietors of the Middlesex Canal, passed March 2, 1803, said proprietors were allowed the term of three years from and after the 22d day of June the next, to complete the same canal to Charles river, and to effectuate means of communication between said canal and the town of Boston across said Charles river by boats, and were allowed the further term of six years to render Concord river boatable and navigable, and for cutting their canals in the County of Middlesex.

And the defendants, further answering, say that in 1798, after the passage of said act of that year, the proprietors of the Middlesex Canal purchased said mill privileges on the Concord river at Billerica, and erected a dam for the purpose of raising a head of water to supply their canal, using the surplus to operate their mills, the grist-mill formerly on said stream having the first right; that in 1804 they completed their canal from Merrimack river to Charles river, and opened it for public navigation, taking toll therefor, using the head of water so raised in Concord river to feed their canal, and the surplus, whenever any there was, to run their said mills.

And the defendants, further answering, say, that in 1826, finding their dam insufficient to raise the water for their purposes, said proprietors built a new and more permanent dam in connection with the old one, which is the dam now maintained by said petitioners.

And the defendants, further answering, say that from the year 1804 down to the year 1851 the proprietors carried on their canal, using in the dry season all the water of the river for keeping up the navigation on their canal, and the surplus for their own mills, the canal retaining the first right thereto, and the same proprietors claim to hold and have the right to use all the water of said river for the purposes of navigation, and the rights of the public therein until the same may be lawfully discontinued; and that afterwards they applied for leave to wind up their affairs, to the Supreme Judicial Court sitting in and for the County of Suffolk, which leave was refused and their petition dismissed, and said corporation still exists and holds all said water for a public use.

And the defendants, further answering, say that all the water of the Concord river, including that of Sudbury river, was taken, held and appropriated forever to the public use; to wit, to be diverted from said Concord river, and was so diverted into Charles river, and the Merrimack river, to furnish means of navigation in a public canal, opening above said dam, and that damages were paid for such public use of said water, to all persons having any

right therein, and injured by such diversion.

And the defendants, further answering, say that the proprietors of said Middlesex Canal had not, under their charter and the several acts in addition thereto, any right or power to sell, convey or assign any right to any person whomsoever, to use said water as against any other public use of the same, which taking of said

water by the City of Boston is for a public use.

And the defendants, further answering, say that said Middlesex Canal only took by purchase or otherwise the lands, waters and water-power incident and appertaining thereto and connected therewith to "themselves and their successors for a public use forever, as a public corporation, and not with power to assign, sell, hold or make profit out of the same after they had ceased to exercise their rights for a public use under their charter, or surrendered their charter, and that said mill privileges and all rights purchased by them became and were real estate or property of the shareholders of said canal, except in so far only as the several shares become personal property for certain purposes set forth in said acts, and are now the property of said shareholders, if the said real estate has not reverted to its original owners.

And said defendants, further answering, say that said petitioners have no other or different rights in said water-power than those which the proprietors of said Middlesex Canal have, or which said proprietors have lost through the forfeiture of their charter if the

same is forfeited, or may be forfeited, for non-use.

Wherefore the defendants ask to be dismissed of this petition, and go thereof without day, and for their resonable costs in this behalf sustained.

LINUS M. CHILD,
BENJAMIN F. BUTLER,
Attorney and of Counsel for the City of Boston.

The evidence and title, so far as it is applicable, put in in the case of Talbot et al. vs. City of Boston, as above printed, to be the only evidence upon which this case is to be tried, and the arguments to be applied to both cases.

PETITION FOR THE DISSOLUTION OF THE MIDDLE-SEX CANAL CORPORATION.

SUPREME JUDICIAL COURT.

Suffolk, ss.

March Term, 1852.

To the Honorable the Justices of the Supreme Judicial Court, now holden at Boston, within and for said County:—

The petition of the proprietors of the Middlesex Canal humbly showeth that said proprietors were incorporated by an act of the Legislature of Massachusetts, passed June 22, 1793, and thereby and by sundry acts additional thereto, your petitioners were authorized to construct and maintain a canal for the transportation of passengers and freight from the Merrimack river to the Charles river, and otherwise, as in said several acts, to all of

which your petitioners beg leave to refer, will more at large

appear.

And your petitioners further represent that the said canal was thereafter constructed and completed in accordance with the provisions of said acts, and was opened to and used by the public for many years, to the great accommodation of the public travel and traffic, and to the great improvement and advantage of those portions of the State connected or traversed by said canal.

And your petitioners further represent that by reason of circumstances beyond the control of the corporation, the expense of constructing the said canal greatly exceeded the estimates, and that the revenue derived from the same has always been very small in

comparison with the cost.

That your petitioners realized no profit or income from their investment for twenty years from the commencement of the work, and that in 1836 the complete opening of travel on the railroad built by the Boston & Lowell Railroad Corporation, and the greater facilities thereby created for the transportation of freight and passengers diverted from your petitioners' canal the greater part of the business from which its support was derived, and in 1848 the completion of the works for supplying the City of Boston with pure water, by cutting off some of the most important headwaters in seasons of drouth, of the said canal, have rendered the supply of water in the canal too uncertain and precarious to be relied on as a means of transportation, and the canal, in consequence thereof, has fallen into disuse, and is no longer of any public benefit or importance, while the necessary current expenses of the said corporation in maintaining the same, amount to a very large annual sum, beyond its receipts. And at a legal meeting of the said corporation, duly called for that purpose, and holden on the nineteenth day of May now last past, a majority in interest of all the proprietors being personally present or duly represented thereat, it was, among other things, unanimously voted that the directors of the said corporation should be thereby authorized, in behalf of all the proprietors, to apply to your Honors for leave to close the concerns of the said corporation.

Wherefore, your petitioners pray that they may be authorized to close their concerns, and wind up their affairs, and that said corporation may be dissolved in the manner provided by law for the same, and that a decree for that purpose may be passed by this Honorable Court; and as in duty bound will ever pray, etc.

(Signed)

EBEN CHADWICK,

President.

COMMONWEALTH OF MASSACHUSETTS.

SUPREME JUDICIAL COURT.

Suffolk, ss.

March Term, 1852.

Upon the foregoing petition it is ordered, that the petitioners give notice to all persons interested, to appear before this Court, to be holden at Boston, within and for said County of Suffolk, on the

first Tuesday of October next, by adjournment from the first Tuesday of March last, by publishing an attested copy of the foregoing petition, and this order thereon, three weeks successively in the Boston Daily Advertiser and the Boston Post, two newspapers printed in said Boston, the last publication in each of said newspapers to be thirty days at least before said first Tuesday of October next, that they may then and there show cause why the prayer of said petition should not be granted

By the Court,

GEO. C. WILDE, Clerk.

June 28th, 1852.

SUPREME JUDICIAL COURT.

Suffolk, ss.

March Term, 1853.

In re Proprietors of the Middlesex Canal, petitioners, etc.

And now the proprietors of the Sudbury meadows, a corpora tion duly established by law, for the purpose of improving the meadows bordering on the Sudbury river (and also, individually as owners of large and very valuable tracts of meadow lands bordering on said river), having been served with a notice of said petition, pray leave to appear and show cause why the prayer of the said petitioners should not be granted, show to the Honorable Court that true it is the petitioners were incorporated as in their petition set forth; that after long delays the petitioners constructed and opened their canal for the use of the public for water carriage, and kept the same open for a long time, to wit, till the first day of October, in the year of our Lord one thousand eight and fifty-one, and long before the filing of their said petition; when, in neglect of their corporate duties and obligations, in violation of their charter and to the manifest abandonment and disuser of their corporate franchises, said petitioners knowingly and wilfully caused and suffered their said canal to become wholly ruinous, out of repair and unfit for use, and the locks and sluiceways thereof to be broken down, filled up, and their whole canal to be so stopped up as wholly to impede and hinder all navigation and water carriage thereon, and the same to remain so impeded and hindered to the day of the filing of their said petition.

And the respondents further show, that in the construction of said canal and in the course of supplying it with water, heretofore, to wit, in the year one thousand seven hundred and ninety-six, the petitioners built a dam over and across the Concord river, so called, in the town of Billerica, which river is a continuation of said Sudbury river, by means of which the waters of said Concord river and said Sudbury river were greatly obstructed and hindered, and the lands of your respondents were greatly overflowed and damaged, which said dam the petitioners have kept up and maintained from thence to the date of filing said petition, and still do keep up and maintain, whereby the lands of your respondents were and still are greatly overflowed and damaged.

And your respondents further show that the petitioners, for the

purpose of increasing the water-power by which they worked said canal, and for the purpose of obtaining power to work certain water-mills which they had acquired and intended to erect, and in disregard of the rights of your respondents and of any injury caused them thereby, heretofore, to wit, on the twentieth day of August, which was in the year one thousand eight hundred and twentyeight, did erect, construct and finish, a certain other dam over and across said Concord river, at said Billerica, a little way below said first-mentioned dam; which last erected dam was higher, tighter and broader than said first-mentioned dam, and by itself and certain injurious contrivances called flash-boards, by said petitioners kept up, caused the water of said river to flow back to a much greater height, and to set back in and upon the lands of said respondents for a longer space of time during each year, and to a greater extent, than had ever before been done: which last erected dam the petitioners have kept up and maintained from thence, to the date of the filing of said petition, and still do keep up and maintain; whereby the lands of your respondents are greatly damaged, and rendered nearly valueless, and said Sudbury river is wholly impeded and obstructed, and the cost of clearing the same greatly enhanced.

And your respondents further show and aver that their lands were of great value, to wit, the value of one hundred thousand dollars, and were greatly injured and damaged as aforesaid, by the acts and doings of the petitioners in the premises; yet, for all such injury and damage, or for any part thereof, your respondents, although seeking reparation by every means which they were advised and believed lawful and without any fault on the part of your respondents, have never received or obtained any satisfaction, remuneration or compensation whatever, either from said petitioners

or any other source.

And your respondents are informed and believe, that although true it is, that said canal has been closed up and abondoned, as is hereinbefore set forth, and although the purpose for which said head of water was raised, and the lands of your respondents overflowed as aforesaid, no longer exists, and all the rights, immunities and privileges in any way taken from your respondents by said petitioners, for the purpose of furnishing the public with the means of water-carriage along said canal, ought of right to revert to your respondents, so that these lands be no longer burdened therewith, or the purposes and designs of your respondents hindered thereby; yet the petitioners, while they have lain down the burden because of which they were by law authorized to erect said dams and waterworks before described, and no longer supply the public travel with any water carriage by means of the head of water so raised, are endeavouring, either by themselves or those persons to whom they have wrongfully conveyed the said dams and the water-works therewith connected, to maintain and keep up said dams and head of water aforesaid, for the purpose of working certain water-mills, thereby taking the profit of the land of your respondents, without compensation.

And your respondents further aver that all persons who may

pretend to have purchased or acquired any rights to said dams, or the water-power raised thereby, have taken or acquired the same with the full knowledge of the limitations, liabilities, restrictions and trusts under which said water-power and dams were held by said petitioners, and of the rights and claims of your respondents. All which actings and doings are contrary to equity and good conscience, and tend to the manifest injury and wrong of your respon-Wherefore, your respondents humbly pray that the prayer of said petitioners be not granted, and that said corporation be not dissolved by a decree of this Honorable Court, or anything be done here, by which the stockholders in said corporation be released from any personal liability to which they may now be subject, until the petitioners remove said dam by them erected as aforesaid, and restore the bed of said river to its former condition as near as may be, and relieve the land of your respondents from flowing and damage by them caused and maintained.

And your respondents further pray that said petitioners, by a definitive decree of this Honorable Court, may be enjoined from maintaining further, said dams; and that they be ordered to remove the same at their own expense, in such manner as this Honorable Court may order, so that the lands of your respondents may no longer be wrongfully injured thereby, and your respondents hindered in the removal of obstructions in said Sudbury river, and in the improvements of the meadows lying adjacent thereto, and for such other and further remedies in the premises as to this

Honorable Court may seem meet.

And your respondents will ever pray as in duty bound.

(Signed)

Proprietors of Sulbury River Meadows, By B. F. BUTLER.

SUPREME JUDICIAL COURT.

Suffolk, ss.

November Term, 1852.

THE PROPRIETORS OF THE MIDDLESEX CANAL, PETITIONERS, ETC.

THE ANSWER OF JAMES R. FAULKNER AND CHARLES FAULKNER.

And now James R. Faulkner and Charles Faulkner come and object to the granting of the prayer of said petitioners, and as the reason of their said objection, represent and give this Honorable Court to be informed as follows:—

These respondents answering say that in the year 1796, the said proprietors of the Middlesex Canal, soon after their incorporation, and acting under and by virtue of their charter, erected and built a dam across Concord river, at the Canal Mills, so called, in Billerica, in the County of Middlesex, for the purpose of feeding and supplying their said canal with water.

That by the erection of said dam, valuable water-rights or mill privileges were created, which belonged to and were the property

of said proprietors.

That subsequently, on the 4th day of May, A.D. 1825, the said proprietors being still the owners of said water-rights or mill privileges, conveyed to Francis Faulkner, the father of these respondents, late of said Billerica, but now deceased, by a good and sufficient deed of warranty, for the consideration of twenty-five hundred dollars, a certain portion of said water-rights or mill privileges, together with certain real estate situated in the vicinity of, and adjoining to, said dam and mill privileges, which said conveyance of said water-power was in the following words:—

"And the said corporation do also grant by these presents, unto said Faulkner, his heirs and assigns, the privilege of using the water which passes through one-half of the creek leading from the mill-pond to the fulling-mill in the channel as it now runs, under the mill now in the possession of said Faulkner, for the purpose of working said mill and factory as it now is connected therewith whenever the exercise of such privilege shall not deprive the grantors or their assigns of an ample and sufficient supply of water for all purposes and occasions, not exceeding, however, the quantity which is or may be requisite for the Middlesex Canal and to carry the grist-mills and saw-mills of said grantors as they now are, whether used by the grantors or others to whom they may choose to sell or dispose of the same for the same or any other purpose."

And said proprietors in said deed further covenant "that they will warrant and defend the same premises to said Faulkner, his heirs and assigns forever, against the lawful claims and demands of all persons, and that in case they hereafter grant to any person or persons a right to use the water which passes through the half of the creek mentioned above, and which remains at the disposal of said corporation, the grantee or grantees thereof shall not be authorized to use the water passing through said half of said creek after the water in the pond ceases to run over the top of the dam, and is within three-quarters of an inch of the top thereof, in order to secure to said Faulkner, his heirs and assigns, the exclusive use of the water in said creek during the continuance of said grant when the water ceases to run over the dam and is within

three-quarters of an inch of the top thereof."

All which will more fully appear by reference to said deed, but

which need not be here more fully set forth.

And these respondents further answering, say, that on the 15th day of March, A. D. 1826, the said proprietors conveyed by good and sufficient deed of warranty another portion of said waterrights or mill privileges to one Nathan Mears, who subsequently conveyed the same or a portion thereof to the said Francis Faulkner, by deed or deeds in due form; all which will more fully appear by reference to the Records of Deeds for said County of Middlesex, where the same are duly recorded, but which need not be here set forth.

And these respondents further answering say, that subsequently to the aforesaid conveyance from said proprietors to said Francis Faulkner, the said Francis Faulkner erected mills, factories, storehouses and other buildings, for the manufacture of woollen goods, upon the lands conveyed to him as aforesaid, by said proprietors,

the water-power for the carrying on of which said mills and factories, was the water-power purchased by said Francis Faulkner, of

said proprietors, and of those claiming as aforesaid:

That thereafter during his lifetime, the said Francis Faulkner, and since his decease, these respondents, who are now the owners, and in possession of said mills and factories, deriving their title to the same from said Francis Faulkner, and having all his rights and interests in and to said water-rights or mill privileges, and all his claims and remedies for injuries thereto against said proprietors, under their said deed or deeds of warranty to him, or to those from whom he purchased, have carried on and still do carry on the business of manufacturing woollen goods in said mills and factories, which said property is of great value, to wit, of the value of fifty thousands dollars.

And these respondents further answering say, that they are informed and believe that the owners of meadow lands, situated in the Town of Sudbury and East Sudbury, adjoining said Concord river, allege that the erection of said dam, has ever since caused the water of said Concord river to flow back, and to overflow the said meadows, by which the crops of grass thereon have been injured and destroyed, and also that the rebuilding or repairing of said dam in 1826 has caused said waters to flow back, and overflow said meadows ever since to a greater extent than before such repairing or rebuilding - and claim the right to have said dam cut down in part, so that the waters of said Concord river, may flow unobstructed and unimpeded by said dam, so far as the same has been heightened or enlarged, at any time, by said proprietors; and that said owners of said meadows threaten and intend, so soon as said corporation shall be dissolved, to institute legal proceedings for the purpose of procuring the cutting down of said dam, as it existed before it was built or enlarged by said proprietors, alleging and claiming that said proprietors derive their right to cause the overflowing of said meadows solely under and by virtue of their said charter.

And these respondents further answering say, that any diminution of the present height of said dam would utterly destroy their said rights or mill privileges, and render them of no value, by rea-

son of reducing the present head of water.

And these respondents further answering say, that if the prayer of said petitioners should be granted, and said corporation be dissolved, these respondents would be wholly without remedy against said proprietors, as warrantors in the deeds aforesaid, and especially in the deed bearing date May 4, A. D. 1825, before mentioned, in case of the breach of the warranty or guaranties therein contained, by being deprived of the water-power granted them in the said deeds.

Wherefore these respondents pray, that their reasonable objections to the granting of the prayer of said petitioners may be sustained by this Honorable Court, and said petition be dismissed.

JAMES R. FAULKNER, CHARLES FAULKNER.

By their Attorney, GEORGE H. PRESTON.

Suffolk, ss.

March Term, A. D. 1853.

PROPRIETORS OF MIDDLESEX CANAL, PETITIONERS, ETC.

And now Charles P. Talbot, of Lowell, in the County of Middlesex, and Thomas Talbot, of Billerica, in said county, manufacturers, respectfully represent to this Honorable Court that they are parties interested in the subject-matter of the petition of said proprietors of the Middlesex Canal, and in the objections and prayer of proprietors of the Sudbury meadows contained in their answer filed in this cause, because they are the owners of a large tract of land situate in said Billerica, on both sides of Concord river, where the same is crossed by the Middlesex Canal, together with a dam across said river, with extensive and valuable millprivileges in the waters of said river created by said dam, and also valuable water-mills situate upon said lands; and the said Talbots give this Honorable Court to be informed that said lands, dam, and water-rights and privileges and mills were before the presentation of said petition in this case conveyed to them in fee simple by said proprietors fof the Middlesex Canal by deed, duly executed and recorded; that the said dam across said river, by which said water and mill-privileges are created and kept in operation, was also used to furnish a supply to the said Middlesex Canal, but that the right to maintain said dam for the purpose of creating a millprivilege and water-power rightfully and legally existed for a great length of time before the creation of the said proprietors as a corporation; and that the said land and dam, and the mill-privileges and water-power aforesaid was purchased by the said proprietors, and was not taken by them by virtue of their act of incorporation; and that the same dam, after said purchase, was made for the purpose of driving and running the water-mills aforesaid, and also for the purpose of supplying said canal; that the said proprietors of the Middlesex Canal conveyed said lands, dam, mills, and the water-privileges thereto appertaining, to said Talbots in fee simple, whereby the said Talbots acquired the right to the same, and to keep up and maintain said dam for the purpose of driving and running water-mills, and ought not to be affected by the dissolution of the said proprietors of Middlesex canal as a corporation, or by any decree of the Court authorizing the same. And the said Talbots further aver that the said dam is the same described in the answer of the proprietors of the Sudbury meadows filed in this case; and that the right to keep up and maintain the same was not acquired by and under the act incorporating the proprietors of the Middlesex Canal, but existed long before the establishment of said corporation; that the same, and the lands upon which it is built, and all the water-rights, privileges and powers upon and appurtenant thereto belong to the said Talbots in fee simple, and that they have the right to keep up and maintain said dam, independent of, and not derived from, the act of incorporation of the said proprietors of the Middlesex Canal.

Wherefore the said Charles P. and Thomas Talbot humbly pray that no decree of this Honorable Court in the premises be made affecting the rights of said respondents to keep and maintain said dam, and to use the water-power and privileges thereby created, or ordering said dam to be cut down and removed, as prayed for by the proprietors of the Sudbury meadow in their answer filed in this cause.

CHAS. P. and THOMAS TALBOT,

By their Solicitors,

ABBOTT & BROWN.

SUPREME JUDICIAL COURT.

Suffolk, ss.

October Term, 1863. November 17, 1863.

PROPRIETORS OF MIDDLESEX CANAL PETITIONERS, TO CLOSE CONCERN.

It is agreed that the above petition be dismissed without costs to either party.

J. G. ABBOTT, GEO. H. PRESTON, For Respondents. S. L. THORNDIKE, For Petitioners.

COMMONWEALTH OF MASSACHUSETTS.

SUFFOLK, SS.

At the Supreme Judicial Court, sitting at Boston, in said County of Suffolk, for the hearing of cases in equity, at the October Term of said Court, begun and holden the first Tuesday of October, being the sixth day of said month, in the year of our Lord eighteen hundred and sixty-three, and on other days between the first Tuesday of October in the said year and the first Tuesday of April, eighteen hundred and sixty-four.

Proprietors of the Middlesex Canal, Petitioners, for leave to close its concerns.

And now it is ordered, with the agreement of parties, that this petition be dismissed, without costs.

COMMONWEALTH OF MASSACHUSETTS.

SUFFOLK, SS.

I, John Noble, Clerk of the Supreme Judicial Court within and for said County of Suffolk, hereby certify that the foregoing is a true copy, as appears of record.

In witness whereof, I have hereunto set my hand and affixed the seal of said Court this twenty-ninth day of December, in the year of our Lord eighteen hundred and seventy-five.

JOHN NOBLE.

Clerk.

CLOSING ARGUMENT OF GEN. BUTLER FOR THE DEFENCE.

May it please your Honors: — For convenience' sake, by arrangement with my brother, we will argue the two cases as though they were together, and thus save the necessity of twice going over the matter; for they both stand upon precisely the same principles of law, and only differ in fact by the one petitioner being entitled to the surplus water sub modo, and the other being entitled to the water up to the surplus, under certain conditions which are set forth in the testimony.

These causes raise some peculiar and interesting questions of law, which have not been previously decided in this Commonwealth, — although analogous questions have been so decided, — which we think will lead to the conclusion that the gentlemen petitioners do not own the water, whatever may be the state of title as to the land, at Billerica They both claim, under conveyances from the Middlesex Canal. There is no evidence of the manner in which the Middlesex Canal acquired their title, either to the land or water, except to the old grist-mill, and a small portion of land on the west side of Concord river. That appears to have been acquired by deed from the proprietor, Mr. Osgood, who acquired it by vote from the town of Billerica; and while it does not appear what the title of Billerica was to it, yet I suppose that it may well enough have been settled by long user and enjoyment. Honors are left, therefore, in doubt, or rather without information, as to what was the title of the Middlesex Canal; whether they took it by right of eminent domain, by force of their charter, or whether they acquired any portion of the land by deed. It becomes necessary, in the first place, to see exactly what was the nature of the corporation of the Middlesex Canal, and to trace its legislative history. It was originally incorporated by an act passed June 22, 1793, found in Special Laws, volume 1, page 465, et seq. It was a custom in those days in granting corporate acts, to grant them in very different form and with different powers from what have come to be the corporate powers since that time. Indeed, this is one of the very earliest of the corporate acts of Massachusetts.

"AN ACT FOR INCORPORATING JAMES SULLIVAN, ESQUIRE, AND OTHERS, BY THE NAME AND STYLE OF THE PRO-PRIETORS OF THE MIDDLESEX CANAL.

"Whereas, James Sullivan, Esq., and others, have petitioned to be incorporated for the purpose of cutting a canal from the waters of Merimack river into the waters of Medford river; and whereas, it is represented that sundry persons are ready to raise funds sufficient for the purpose of opening the same canal:—

"Sect. 1. Be it therefore enacted by the Senate and House of Representatives, in General Court assembled, that the said James Sullivan, Oliver Prescott, James Winthrop, Loammi Baldwin, Benjamin Hall, Jonathan Porter, Andrew Hall, Ebenezer Hall, Samuel Tufts, jun., Aaron Brown, Willis Hall, Samuel Swan, jun., and Ebenezer Hall, jun., their associates and successors, are hereby incorporated, and shall be a corporation forever, under the name of The Proprietors of the Middlesex Canal, and by that name may sue and prosecute, and be sued and prosecuted, to final judgment and execution; and shall be, and hereby are, vested with all the powers and privileges which are by law incident to corporations of a similar nature.

"Sect. 2. And be it further enacted by the authority aforesaid, That the said proprietors, or any three of them, may make their application to any justice of the peace for the County of Middlesex, requesting him to call a meeting of the said proprietors, to be holden at some convenient place within the town of Medford, in the same county; whereupon such justice is hereby empowered to issue his warrant to one of said proprietors, directing him to warn and notify said proprietors to meet at such time and place in said town of Medford, as he shall therein direct, and agree on such method as may be thought proper for calling meetings of said proprietors for the future, and to do and transact such matters and things relating to the said propriety, as shall be expressed in the warrant.

"And the proprietor to whom such warrant shall be directed, shall give notice to said proprietors, by causing the same, or the substance thereof, to be published in one of the Boston newspapers fourteen days before the holding of said meeting, and make return thereof, under his hand, to the same meeting, to be lodged with the clerk that shall be then and there chosen. And the said proprietors may, at the same or any other legal meeting, choose a clerk, treasurer, and other officer or officers of the corporation, that they may deem necessary; and also may choose a committee for ordering and regulating the business and affairs of the said corporation; and every proprietor shall have a right to vote in the proprietary meetings, according to his share and interest, in person or by representation, in the following ratio, viz.: From one hundred to three hundred dollars, inclusive, there shall be allowed one vote; from the three hundred and one to six hundred dollars, inclusive, shall be allowed one vote more; and for every thousand above one thousand shall be allowed one vote more; provided, no one proprietor shall have more than twenty votes; all representations to be proved in writing, signed by the person making the same, by special appointment, which shall be filed with and recorded by the clerk; and this act and all rules, regulations, and votes of the said corporation shall be fairly and truly recorded by the said clerk in a book or books for the purpose to be provided and kept; provided, that whereas it may be necessary in the prosecution of the foregoing business, that the property of private persons may (as in the case of highways) be appropriated for the public use; in order that no person may be damaged by the digging and cutting canals through his land, by removing mills or mill-dams, diverting water-courses, or flowing his land, by the proprietors aforesaid, without receiving full and adequate compensation therefor.

"Sect. 3. Be it enacted by the authority aforesaid, That in all cases where any person shall be damaged in his property by the said proprietors, for the purposes aforesaid, in manner as is above expressed, or in any other way, and the proprietors aforesaid do not, within twenty days after, being requested thereto, make or tender reasonable satisfaction to the acceptance of the person damaged by them as aforesaid, the person so damaged may apply to the Court of the General Sessions of the Peace, for the county in which the damage shall have been sustained, to have a committee appointed by said Court at his own expense, to estimate the damage so done; and the said Court are hereby authorized and empowered by warrant under the seal thereof, upon such application made, if within one year from the time of the damage done as aforesaid, to appoint a committee of five disinterested freeholders in the same county, to estimate the damages; which committee shall give seasonable notice to the persons interested, and to the clerk of the proprietors aforesaid, of the time and place of their meeting; and they shall be under oath to perform said service, according to their best skill and judgment, which having done, they, or the major part of them, shall make return thereof, under their hands and seals, to the next Court of General Sessions of the Peace to be holden in said county, after the same ser-

vice is performed, to the end that the same may be accepted, allowed, and recorded; and the committee so empowered are required to estimate the said damage and make return thereof as aforesaid; and if the estimate of the committee be accepted by the Court, the clerk of the Court is hereby authorized and directed on application therefor to issue an execution against the property only of the corporation, or of any individuals belonging thereto, for the sum so adjudged in damages; provided, the same is not paid within twenty days after the acceptance of said report, and likewise for the cost of the said committee and fees of the Court, both to be allowed by the Court; provided, the sum of damages estimated by the committee exceed the sum of damages so tendered. But in case the proprietors actually tendered to the person complaining, before the complaint was exhibited, a sum as great as that allowed by the Court in damages, then nothing to be included in the execution for costs of committee or Court. The execution to be issued by the clerk of the Court, to be in the same terms, mutatis mutandis, and returnable in the same time as though judgment had been rendered against said corporation for a like sum, in damages, on process in the Court of Common Pleas; and if any person find himself aggrieved by the doings of said committee, in estimating damages, he may apply to said Court of General Sessions of the Peace; provided, such application be made to the same Court, at the next session thereof, in the same county, after the acceptance of such return; and said Court is empowered to hear and finally determine the same, by a jury under oath, to be summoned by the sheriff or his deputy for that purpose, if the person complaining desires the same, or by a committee, if the person complaining and the proprietors can agree thereon.

And if the jury or committee, agreed on as aforesaid, who are to be under oath, shall not increase the sum of damages, the person complaining, shall be at the cost arising on such complaint, to be taxed against him by the said Court, otherwise such cost and increase of damages shall be paid by the proprietors, and execution to issue therefor, as aforesaid expressed. And it shall be the duty of such committee or jury, on application of either of the parties, and reasonable notice given to all persons interested, to determine where and how many bridges shall be made and maintained by said proprietors over the canal aforesaid, and how the same shall be constructed, and what damages shall be paid by the proprietors for neglecting to make and maintain such bridges; and the report of such committee or verdict of such jury being returned into the same court, and being allowed and recorded,

shall be a sufficient bar against any action brought for damages aforesaid, saving only that where the sum of damages is not estimated at a sum in gross for the full satisfaction thereof, but a yearly sum is assessed; in such case the complainant shall be entitled to an action of debt for the recovery of the same, so often as the same becomes due, during the continuance of the damage done or suffered as aforesaid, and also for the recovery of the damages for neglecting to make and maintain the bridges, as often as the same is demandable; provided, That no part of the waters of the Shawshine river shall be diverted from their natural course for the purpose aforesaid; and that no dwelling-house shall be removed or water-course turned or altered whereon any mill is erected, so as to injure such mill, without license therefor, first had and obtained from the Court of General Sessions of the Peace of the county in which such house may stand, or through which such water-course may pass; and the said Court of Sessions, on application made to them by the said proprietors, shall observe the same rules as are prescribed by law, when application is made to them for granting a public highway. Provided, also, that the waters of Merrimack river shall not be so diverted from their natural course as to impede, or any way interrupt the water carriage down the Merimack river to the mouth thereof."

As you have already heard, the Concord river, at the place where the canal closes, is about 28 to 30 feet higher than at the place where the canal entered it. You will see that immediately by a little calculation. There is about thirty feet fall from the place where the canal entered the Merrimack river, down to the mouth of the Concord, on the one side. At Billerica there is eleven feet fall. At the Wamesit dam there is twenty-six feet fall. At the Massuc dam there is eight feet fall. At the Middlesex below there eleven feet fall, and then there is a very considerable fall where the two meet at the mouth, — leaving twenty-eight or thirty feet fall; so that it was impossible, if the Legislature had known it, or the projectors had known it, to have diverted the water of the Merrimack river into the Medford river, as the Therefore it became necessary to take the charter provides. Concord for a feeder; and it is a little remarkable in this legislation that there is no provision made for that anywhere; but it is an express restriction that they shall not alter or change any water-course upon which there is a mill, without the special license of the General Sessions of the Peace. And so far as my researches have extended (and they have been prosecuted from time to time over a period of almost thirty years, in various suits), I have not found any license

from the General Sessions of the Peace, to alter or disturb Concord river.

The fourth section provides against anybody's damaging the works of the company; and the fifth section authorizes and empowers the proprietors "to purchase and hold, for them or their successors forever, so much land and real estate as may be necessary for the purposes aforesaid, not exceeding the value of five thousand pounds." This is simply an authority to purchase and hold. You will observe that it is limited carefully.

Then the sixth section provides for tolls to reimburse them, the seventh for toll-gatherers, and the eighth section

limits the time within which the canal is to be built.

The only grant of power is for them to take lands and to

hold lands necessary for their purpose.

The company commenced operations, and found it necessary to apply again to the Legislature, which they did, and obtained an act of incorporation, February 28th, 1795, Second Special Laws, p. 26. And that act provides:—

"That the property of the said proprietors in the said canal, and in any other canal connected therewith, which they shall effect, pursuant to any authority of the government, and all real estate, of which the said corporation shall be seized, shall be divided into eight hundred shares, and that each share therein shall give the person holding the same one vote in the proceedings of the said corporation: provided, that no one proprietor shall have a right to more than twenty-five votes on any occasion; and that the shares in the same canal, including the towing-paths and wharves thereon, shall be so far considered as personal estate, that the same may be transferred according to such rules and regulations as the said corporation shall establish; and that the proprietors shall be subjected to taxes therefor, in the towns and parishes where they shall severally reside, as for personal estate."

Then, for the purpose of making deeds, and for the purposes of taxation, the property of the canal was to be personal estate, and for those purposes only; and all the property of the corporation remained—real estate divided among the eight hundred proprietors as real estate, and, of course, passed as other real estate passed, except that when they chose to sell it, it might be sold under such rules as the

corporation established, i. e., under their by-laws.

Then the second section provided "that the said corporation shall have power to receive and hold real estate as appendant to the same canal"—mark the words "as appendant to the same canal"—and for the purpose of facilitating

the business of the same, to the value of thirty thousand pounds over and above the value of the canal itself, simply considered, and that the corporation shall be liable to pay taxes therefor in the town and parish where the same may be; and such taxes may be assessed on the corporation, or on its tenants, at the discretion of the town where the tax shall be made."

"And whereas the said corporation has petitioned the Legislature for an extension of their powers for the purpose of making other canals, to be connected and to communicate with the said Middlesex Canal; the object of which petition being to render the waters of Concord river boatable as far up as the same may be usefully improved for that purpose, and to improve the banks of the Medford river, so as to render the canal more easy and useful, as well as open a canal round the shallows in the town of Dunstable, on the banks of Merrimack river; and also to extend said canal to the waters of Charles river, or the town of Boston,—

"Be it further enacted, That the said proprietors of the Middlesex Canal shall be empowered to render the waters of Concord river boatable as far as Sudbury causeway, and as much farther as the same can be usefully improved for that end, and to open any canal at any place in the said County of Middlesex that may be necessary to connect the said Concord river with the said Middlesex Canal for that purpose, and also to extend said canal from Medford to the waters of the town of Boston, or Charles river, in such way as to said proprietors may seem most advantageous, and with all the privileges, and under the same restrictions and regulations, as are granted and provided in said act; and that the said proprietors shall be liable to have damages recovered against them by any individual who shall be injured or damnified in his property in such new canal, by the same mode of process and in the same manner as is in the same act provided; and that for the use of any such new canal or boatable waters, the said proprietors may receive the same rate of toll which is by the same act established for the said Middlesex Canal.

"Whereas, it is provided in an act entitled, An act for incorporating James Sullivan, and others, by the name and style of The Proprietors of the Middlesex Canal, 'That no part of the waters of Shawshine river shall be diverted from their natural course for the purpose aforesaid:' it is hereby declared to be the true intent and meaning of the foregoing restrictive clause, that the ponds and those streams which continue a visible current through the year, and usually empty into Shawshine river, are to be considered as

part of the waters of the said river," which is the earliest legislative definition of what shall be considered a stream, or "water of a river;" and that a pond which, without damming, is not a visible stream through the whole of the year, is not considered a part of the waters of the river. It may bear upon no part of this investigation, but it is a legislative declaration of what should be considered.

Then another act was passed on the 25th of June, 1798 (Second Massachusetts Special Laws, vol. 2, p. 241), which

recites:-

"Whereas, by an act 'passed on the twenty-eighth day of February, in the year of our Lord one thousand seven hundred and ninety-five, it is provided and enacted, that the corporation of the Middlesex Canal shall have power to receive and hold real estate as appendant to the same canal, and for the purpose of facilitating the business of the same, to the value of thirty thousand pounds, over and above the value of the canal itself; and the proprietors of said canal having expressed their doubts whether, in virtue of said act, they may erect and hold mills on the same canal, and on the waters with which it is or shall be connected,—

"Be it therefore enacted by the Senate and House of Representatives, in General Court assembled, and by the authority

of the same, —

"That the corporation of the Middlesex Canal, or the proprietors of the said canal, in their corporate capacity, shall have power to purchase and hold any mill-seats on the waters connected with the same canal, and lands to accommodate the same, and thereon to erect mills; and that all such land or mill-seats so held by the said corporations, shall be liable to be taxed as real estate in the towns where the same shall be, according to the laws in being for assessing taxes; Provided, nevertheless, that nothing herein shall be construed to repeal or annul the restrictions under which the said proprietors and corporation are laid by former acts, respecting the waters of Shawshine river, or the ponds, brooks or streams emptying their waters into the same; and provided, also, that all the mill-seats and land purchased or received by the said corporation shall not exceed the sum of one hundred and thirty thousand dollars."

Now, your Honors will observe that these mill-seats were

to be "appendant" to the canal.

There is no other legislation which I think it of any special importance to bring your Honors' attention to, until in 1860 (as has already been put in evidence) the Legislature passed an act (chap. 203 of the 11th Special Laws):—

"An Act in relation to the Proprietors of the Middlesex Canal.

"Whereas, the Supreme Judicial Court of this Commonwealth, on the third day of October last, upon an information filed by the Attorney General, pursuant to a resolve of the last Legislature, by a judgment and decree, declared that the Proprietors of the Middlesex Canal, or any persons pretending to hold the privileges, franchises, and liberties of the said corporation, do not, in any manner, have, hold, use, exercise, or enjoy the said privileges, franchises, and liberties, under and by virtue of any authority conferred by any act of the General Court of this Commonwealth, and that said Proprietors of the Middlesex Canal be absolutely forejudged and excluded from having, holding, using, exercising, or enjoying such franchises, privileges, and liberties: Now, therefore,

"Be it enacted by the Senate and House of Representatives, in General Court assembled, and by the authority of the same,

as follows: —

"All the privileges, liberties, and franchises, granted or given by the twenty-first chapter of the Acts of the Legislature of the year one thousand seven hundred and ninety-three, incorporating said proprietors, or by any subsequent acts in addition thereto, are hereby declared seized unto the hands of the Commonwealth, forfeited and annulled in consequence of the non-feasance and mis-feasance of said corporation, and the neglect of their corporate duties, in accord-

ance with such judgment and decree."

Now, the next thing to which I have to call your Honors' attention is, that it is in evidence that in 1851 they sold to the gentlemen Talbot, by deed which is before your Honors, a portion of this water-power on the west side of the river. They had previously sold a portion of the water-power on the east side of the river to Mears and others, which by certain mesne conveyances came into the hands of the Faulk-Then the gentlemen Faulkner and Talbot undertook, by interchanging deeds, to divide the water-power among them; and, in the first place, the deed to the gentlemen Talbot is a quitclaim deed from the Middlesex Canal, and expressly contains a clause that they do not sell any water or any right there whatever in those lands that may be necessary for the canal to use. They reserve those. Now, what was the effect of that reservation, and how have the courts construed that in the case of Heard against Talbot, 7th of Gray's Reports, p. 113, which I have already cited to you for another purpose?

It is agreed that—

"At the time of the abandonment of the use of their canal, and as a part of the winding-up of their affairs, the proprietors sold all their land and the residue of the water-power by them unsold, raised by their dam aforesaid, to the respondents by deed of quitclaim, 'subject expressly to the reservation of all easements and services necessary for or incident to the preservation and use of said canal for the purpose of navigation, and of all the rights of the public therein, until the same shall be lawfully discontinued;' and the respondents have since that sale maintained and kept up the water by said dam for manufacturing purposes, and claim to use the same in such manner and to such extent as may suit their convenience for such manufacturing purposes, subject to said reserved

right of said canal."

Now, then, the question before the Court was: What is the effect of that sale? Because the gentlemen, Talbot et al., were keeping up their dam to the injury, as was alleged, of the meadow-owners above; and the meadow-owners above came in and said, "Now the canal is wholly disused and stopped up and is not running, and the corporation is winding up its affairs, and therefore we ought not to have our lands flowed any more without damages. While it flowed as a canal we received our pay for it, — in contemplation of law, if not in contemplation of fact, — pay for that damage. now we ask for a jury to assess our right under the mill act, - if this dam can be kept up at all." And the case was argued at that time by myself upon the one side, and by brother Abbott upon the other, and Mr. Justice Bigelow then gave the opinion of the Court, and it is valuable to see exactly what he says the rights of the Middlesex proprietors are: --

"There can be no doubt that the proprietors of the Middlesex Canal, under their original act of incorporation, St. 1793, c. 21, and under the additional act of 1798, c. 16, by which they were empowered to purchase and hold mill-seats on the waters connected with their canal, acquired, as part of their franchise, the right to flow the land of the complainant, and that this right was in its nature a permanent easement or servitude, for which the complainant or those under whom he claims title had an ample remedy in damages provided in the third section of the original charter of the corporation."

Now, then, that was a right to flow — the right to the water, and to keep up the head of the water was a part of the franchise of the Middlesex Canal Company. But all those privileges, liberties and franchises held by the Middlesex

Canal, or by any other person, were in 1860 seized to and taken possession of by the act of the legislature to the Commonwealth, — (seizing is a peculiar word like franchise; it looks to the interest in the realty) — "seized to the Commonwealth."

Now, then, passing on, Justice Bigelow says: "The sole ground on which he now rests his case is that the Canal Corporation have, since the year 1851, wholly disused their canal, filled up portions of it, and suffered it to remain in such condition as to be entirely unfit for use. The argument is, that the right of erecting and maintaining a dam was granted to the corporation mainly for the purpose of enabling them to raise water for the supply of their canal, and the power to hold mills was wholly incidental to and dependent on the appropriation and use of the water raised by the dam, for the great object for which the corporation was established and their franchise granted; that the corporation, having abandoned the use of the canal, and ceased to supply it with water, can no longer claim the right, under their charter, to maintain the dam.

"Admitting, for the sake of giving full force to this argument, the correctness of the premises on which it rests, we do not think the conclusion drawn from them legitimately follows."

And why? Because, he says, we cannot attack the canal, it not having been legally discontinued by force of any law; and there having been this reservation, it is to be presumed that we cannot attack the corporation for non-user or misuser, because that is a matter for the legislature to do.

Commissioner Russell. There is an earlier case in

Metcalf, is there not?

Mr. Butler. Yes, sir; there are three or four. Those are all attempts under the mill act while the Middlesex Canal was running, and they all held, in the language of the court, "that the remedy" in the third section "was an exclusive one, and the time within which parties could legally avail themselves of it has long since passed away."

But now this came up after the canal business had been discontinued. But the court said that the canal not having been ended by legislative act, or by forfeiture under judicial

proceedings, the non-user could not be set up by us.

"It follows from these principles that the franchise of the proprietors of the Middlesex Canal, which includes the right of keeping up and maintaining the dam which flows the land of the complainant, being still in existence, it is not competent for him in this proceeding to show a non-user or abandonment of the canal, as a ground for denying the right of

the corporation to continue the dam; and as the respondents hold their title under the corporation, and justify the flowing of the complainant's land under the corporate franchise, there is no ground for sustaining the present complaint under the mill act against the respondents. It is a sufficient answer to this suit, that the corporation have the legal right to maintain the dam as against the complainant, without pay-

ment of damages.

This view of the case renders it unnecessary to determine the question discussed at the bar, whether the right to purchase and hold mills, which was conferred on the corporation by the act of 1798, was the grant of an additional and distinct franchise or right, which may be used and enjoyed by the corporation or their grantees separately from and independently of the building and maintaining of a canal; or whether it was merely secondary and subordinate to the making of a canal and the raising of water for its supply, and was to cease and become extinguished when the right of keeping and using the canal should be surrendered or forfeited. Now, have we occasion to decide whether the forfeiture or extinguishment of the charter of the corporation would operate to defeat the title of the grantees of the corporation to the mills and water-power, which had been acquired by the corporation lawfully, and conveyed to the respondents by deeds valid at the time they were made, by which the title became vested before such extinguishment or forfeiture took place? The seare important and interesting questions; but it will be quite time enough to settle them when the exigency of a case shall require, in order to adjudicate upon the rights of parties, that they should be judicially determined, - complainant nonsuit, - which exigency has now arisen, if it ever did or can arise.

Mr. Abbott. They did settle it at the time, and gave an opinion, of which I have an abstract, taken down from the

Chief Justice's opinion.

Mr. Butler. Did they settle anything different from that?

Mr. Abbott. They settled something in addition to it.

Mr. Butler. All that may be so; and then it was evident that, after consideration, he came to the conclusion that he did not want anything different from what he had put in the book. He talked outside of the record, and found that he had talked wrong, and he took it back again.

There has been a struggle going on here for seventy-five years, between the people on the Concord river and the people owning or claiming to own the water at Billerica, to try and get some pay, and some rights; and our courts, which in the earlier days had a very strong leaning towards corporations, so much so that it used to be a part of the platform of one political party (which everybody was bound to believe or suffer ostracism), that the corporations owned the courts. That was many years after I came on to the stage.

And, as a matter of history, perhaps, rather than as a matter necessary here, it may not be improper to suggest that this original act of incorporation gave only one year in which a man could petition; and a great many men (I will not say all for a reason which will be obvious) did not find out that they were hurt during that year; because the canal, as the mill-owners allege, were sharp. They did not shut up their dam and raise the water until September. Through the winter nobody knew or cared where the water was; and through the spring nobody cared. It flowed the meadows in having time, and then they were obliged to apply to the Court of General Sessions of the Peace, when in session; and that court did not sit until a few days after the year expired, from the time when they closed up their dam, so that a great many of the mill-owners were short of any redress. And the courts have held always from that time, with a vigor that is praiseworthy, if it is in the right direction, that it must be taken to be settled, that they were all paid for their damages; and any attempt of any of the meadow-owners thus flooded out, or injured by deprivation of water, by the Middlesex Canal, has ever since wholly failed before the courts.

Now, then, in this stage we have come to a case—the Middlesex Canal, all its franchises and privileges, one of which franchises the Supreme Court decide to be the right to keep up the water by a dam. And one would think that that was clearly a decision, "have now been seized to the Commonwealth against all persons whatsoever." And the case in Gray, which I have just read, says that the gentlemen Talbot, the petitioners here, were holding in the right they did hold under the franchise of the Middlesex Canal. That franchise is dead and gone at any rate, and that franchise is seized to the Commonwealth.

Now, what should happen? I have no doubt the Commonwealth has a right to keep up that dam as against the proprietors of the meadows. But nobody else has any right to keep it up. It was higher than it was before the Middlesex Canal took it.

Now, then, it is agreed that the testimony put in this morning shows that the old grist-mill dam, which they bought, was a very poor, miserable, leaky concern, did not keep back any water — and there was not any occasion to

keep back any water, for all it had to do was to saw the logs in the spring and to grind the grain of the inhabitants of Billerica; and, if there was anything like the amount of water running in the stream, in the natural flow, which is claimed for it now, it was ample for that without much of any dam at all. So that they stand upon this horn of the dilemma — either that there was a great deal less water ran in the natural flow of the river before it was aided by reservoirs and dams, in the olden time, so that it was necessary to keep up a very high dam in order to do a very little business in the grist-mill, or else, the same water running, there was no dam required at all of any consequence. The testimony of Mr. Manning gives us a little description of that dam. He says:—

TESTIMONY OF WITNESSES TAKEN BEFORE A LEG-ISLATIVE COMMITTEE CONTAINED IN HOUSE DOCUMENT 100, IN THE YEAR 1860.

Jonathan Manning, being duly sworn, deposed, upon examination by Mr. Child, as follows:—

I reside in Littleton, and have resided there for fifty-seven years.

My age is eighty-four years.

I worked for the proprietors of the Middlesex Canal six summers and two winters, beginning in May, 1796, and ending in November, 1801. I helped build the locks on the Merrimack river, the bridges, sluices, and so forth. I worked at carpenter-work, almost wholly. In 1796 and 1797, I did not work on the dam. In 1798 I helped build the dam. There was a dam previously there, what some called a zig-zag dam, - leaky, and not very high. I never knew the height of either dam, - to my knowledge. dam I helped build was higher than the former one. They made rafts to bring timber from the Merrimack, and there was not water enough, by the old dam, to fill the canal. After the new dam was built, we took down wider rafts, — the canal being wider at top than bottom. The planks used were, I think, two and three-quarter inches in thickness. I never saw the old dam till I went to work, after the canal was fixed in. When there was a flush of water, the guard-gates were opened to fill it. No flash-boards were ever put on the old dam, to my knowledge. I have heard, from Mr. Baldwin, the Superintendent —

Mr. Butler objected.

Mr. Child argued for the admission of the testimony.

WITNESS said, in the course of the conversation, that he did not know that any advantage was taken of the spring freshets. Timber could then be better floated.

Objection having been taken to further testimony offered, Mr. Mellen argued that, before a Legislative Committee, the strict rules of evidence were not necessarily to be enforced, except at the discretion of the committee.

Mr. Butler insisted that, as the rights of the mill-owners were legal rights, they should be affected only by legal testimony. The committee would judge of the relevancy of testimony, but would not hear what could not be evidence.

The Chairman ruled that hearsay testimony was inadmissible.

WITNESS. I recollect that a boat passed up that part of the canal between Concord and Merrimack rivers, with a party from Boston, or Medford, or somewhere.

Q. Who composed the party?

A. I know but two or three men. There was one from Boston, Judge Sullivan, the president of the canal, and old Col. Baldwin and one of his sons. I do not remember many others, nor how many there were, but I should think twenty, twenty-five, or thirty.

[Witness proceeded to speak of information received, at the time, by hearsay, in reference to the raising of the water in the canal, to float the boat. Objection was made, and the testimony rejected as

incompetent.

I do not know how much higher the new dam was than the old; but, - from their raising the water in the canal so much higher than before, - I should think, nine to twelve inches high. After taking the water down six inches, I remember, in the first of June, or the last of May, seeing the gates open. I should think the effect on the depth of the water, of the completion of the new dam would be that they could raise it nine inches or a foot. So I have thought sometimes, by the flowing of the water after they got the dam built, —it flowing up higher into a yard where we worked, and sending us back into higher land. I thought the water was much higher, but I couldn't say. I cannot tell how much water there was in the canal before we built the new dam; I should say there was something like two and a half feet of water when the boat came up. I cannot tell what depth of water the canal required, in order to be full; but I think, three and a half feet. That is my impression; I am not positive, — I think it is correct.

The dam I helped build had a bridge over the stream, the dam below being built so that the water should go over it. There was a little island, and a saw-mill stood on that. The main dam crossed the river; and where the water ran over was what is called a figure-dam. We had a gauge to make it by; and it was put up—I don't know how far apart—I should say, eight feet across the piers, and then stringers locked right on at the side; and then it was planked, slanting up the stream. This was a figure-four.

There was a cap-sill put on to this dam.

The figure was like this: -



After the dam was built, timber, principally, was brought down. The timber and rafts were larger than before. The small was timber for locks: the large, sawed for planking. I think they were much larger. I think I saw one log from which seven planks were sawed, with two slabs.

I saw that dam in 1832 or '33, or about then. There was a stone dam built below it, which covered it up. I then saw the posts of the waste-gate, but they were under water — the tops a little under. They had been built all of a foot higher than the dam. There was a sluiceway for fish to go up, planked the other way. That was lower than the dam. It was kept open every spring.

Don't know when it was stopped.

Mr. Butler. That was all matter of legislation.

Flash-boards were put on the dam I built, before I left; — I don't know when, or by whom. Saw them there the two last years. They said they were ten inches high. I have no judgment about their height. I did not work there much, the last two years.

That section of the canal between the rivers was finished in the

fall of 1797, when Sullivan's boat came up.

Previous to the building of the dam of 1798, there was a pond there, and a mill. It was called a pond. It was there when I was a boy, and went to mill there. The old dam flowed not nearly so high as that I helped build; — I cannot say how much lower.

I frequently conversed with men at work at Mr. Rogers'. Never

saw the ledge, that I know of.

The flash-board was put on to the dam by little posts put up, and a brace. They didn't appear to be fastened. There was no capsill but that on which the planking was nailed. What of the dam was below the bridge was such as to have the water go over.

Now David Heard testified about this time as follows:—

DAVID HEARD recalled. Examined by Mr. Mellen.

I have, at times moved grass in the stream. I was one of the Directors of the Sudbury Meadow-Owners' Corporation, formed in 1816. There was a clearing of the meadows — some years after - mostly. There had been a law-suit, and something said about the weeds; and we thought we would try it. We had two instruments. We used to work, and clear it. I have worked upon all the bars, I guess, from the Concord line, as far as any were worked upon. The principal bars are all hard gravel-pans, in the bed of the river. There were not large deposits upon them, —just enough to start out a weed, which would grow according to the depth of the water. We used to rake them out. A shovel instrument was used, to take out the weeds in deep water, above the bars. That was kept up for a number of years. After 1828, there was quite a change in the stream, and the labor expended after that, seemed to be lost. It was continued up to 1828; and after that there was a change in the river; the water in the river stood higher. The low-water marks stood higher, and continued so. Where we used to drive our teams, it was impossible to go with

them; and we used to take boats, after that, with two or three men in, alongside, fasten to a long pole, or something of that kind, and mow the weeds and let them float. A considerable sum of money was expended by the corporation. After 1833, suits were brought against the Mill Corporations; and the taxes after that were principally for defraying the expenses of those suits. I think I looked over the books, once, to see what amount was probably laid out. There was quite an amount—I think, over a thousand dollars, for clearing the river, from the commencement,—after 1816,—to 1828. It was continued afterwards. The water took a higher stand at low-water—which was the grade of water we chose to operate upon the river. And after that, we did not undertake to go on with teams. What was done was done by plunging into the higher part of the bars, or hiring men to go, or taking boats and working as I have described.

There were extreme points of low-water mark, lower than it is now. I think I have seen it two feet lower than it has been this season. There was a time, previous to 1828, when the water would go down to a certain low point, and then the water would come in above, and raise it up. I have seen the operation of the river at Farm bridge, where the water was shut up above us; the water would fall, from Saturday to Monday morning, an inch or two. By Tuesday night it would come back—sometimes not, but, as a general thing, it was as high. That we called a low state of water. That same operation came upon this water, after a higher grade was produced, at a low state, and when there had been a series of dry times. I think the difference was in the neighborhood of two feet higher than previous to—say—from 1816, when my attention was very particularly called to the river.

Upon my meadows, it is two feet higher than before, at low-water mark. It has submerged my meadows, with one or two exceptions. I have not considered the hay worth cutting. I would give it to anybody, if they wanted to go for it as a general thing. I cannot say but there have been some exceptions. The water, now, in cases of flood, compares, in passing off, with former years, thus: the water goes down to a certain grade — not quite as fast as it used to, but it goes down to a certain grade, — and becomes stationary; whereas it used to go off, to below — well, it would vary as the season was, and as the cause producing the water upon the meadows — I have known it to go down three inches in eight-and-forty hours — but as a general thing, you could calculate that when water was on the meadows three inches, it would go down

Now, I suppose my brothers cannot even understand that the present height of the dam is anywhere near the height of

two inches in a day.

the dam which was bought from Mr. Osgood, — the original dam. So that we need not trouble ourselves very much upon the question which might be mooted, whether the purchase of the mill of Mr. Osgood, being appendant to the real estate owned by the canal, "and for the purpose of facilitating

the business thereof," (that is the act), whether the corporation might sell that or not, — because all there is substantially of the water-power of the river was raised and is made by building the two dams of the Middlesex Canal. The first one, of 1798, was higher, and the next one, of 1826, was higher still. Now, then, it is an agreed fact in this case, may it please your Honors, that in the summer all the water was needed, used, and taken for the canal, and generally more was wanted. And, in the other case, you remember, Mr. Tilden was called here, and says there was no water at all running down at Whipple's, when the canal was running, in comparison with what is running there now. You will remember his testimony. Therefore, if we are right, this dam, and the right to maintain the dam, in the language of the court, in the seventh of Cushing, is one of the franchises of the corporation, has been maintained under that and no other claim, and can be maintained by no other claim, because the moment that Mr. Talbot should call a jury of Middlesex County, and maintain this under the mill act, he and his vast investments there would be swamped, and the damages would be given against him. It would not be worth one straw, if the proprietor of the whole meadows up to Sudbury causeway could get at him for damages. Therefore, he holds under the franchises of the Middlesex Canal. chises are seized to the public use. They were necessary to the enjoyment of the canal. Without them, the canal is worthless, — useless. It could not be worked for an hour by anybody. If the water-power there so raised was not seized by the Commonwealth, the Commonwealth could seize noth-The water is just as necessary for the use of a canal, as the road-bed of a railroad is necessary for the use of the railroad. And my proposition is, that a corporation made for the purpose of building a canal for public navigation, can no more sell the waters which it acquires for that purpose and under that power than can a railroad sell its road-bed and the franchise to use it. The water reverts to those that own it, — if it has not been seized by the Commonwealth, subject to certain rights, which I shall speak of. It was taken for a public use in contemplation of law. It was paid for as for a public use. The Commonwealth have now seized it to itself, in order to open that canal, as it may do any hour, and, in my judgment, ought to do, for the purpose of supplying cheap transportation of heavy merchandise from Boston to Concord, New Hampshire. Now, would anybody say for a moment, may it please your Honors, that if the Commonwealth should open that canal to-morrow, or next week, they would have to pay Mr. Talbot damages for the

use of the water? Well, I take it that nobody will be bold enough to say that. If the Commonwealth are not to pay him damages, why not? It is because it has been taken for a public use, and dedicated for a public use forever, and the canal has no power under its charter whatever to divert it from public use by selling it to private use, and the very sale is a misuse of its charter, by which it might have been forfeited.

Then, let us see where we stand. A part of that water is the water of Sudbury river. It was decided in the case of Stearns and Lumbard, that taking the water of a stream on which were mills, even by a private aqueduct corporation, to supply a portion of the inhabitants of the village of Springfield, was a public use. The Commonwealth have granted us the right to take the water of Sudbury river for a public use. We are to pay such damages as other persons have sustained. But we are not to pay any damages to these petitioners, because that water belongs to the public, and not to them. It is only a change of public use.

This matter was somewhat discussed in the case of Chase vs. The Sutton Manufacturing Company, 4th of Cushing: "Where the land of an individual is taken under authority of the legislature for public use, and full compensation is paid to the proprietor for perpetual easement therein, and the same land is afterwards appropriated by the same authority to public use of another kind, the owner of the

land is not entitled to any further compensation."

Now, this case was this: The Blackstone Canal purchased a certain mill-privilege on the bank of the Blackstone river, and they flowed the land of the complainant. Then they concluded to stop their canal and sell out to the Providence and Worcester Railroad, and they got an act from the legislature to permit them to sell their property. They did not sell it without right. It never occurred to the good lawyers who were advising them, that they had any right to sell without obtaining a special act from the legislature.

"PAUL C. CHASE vs. THE SUTTON MANUFACTURING COMPANY.

"This was a complaint against the respondents for flowing land, which came to this Court, by appeal from the Court of Common Pleas, where it was submitted upon an agreed statement of facts.

"The complainant is the owner of the land described in his complaint, and the same is flowed, as therein alleged, by the respondent's dam.

"In 1822, the Legislature of this Commonwealth passed an act (St. 1822, c. 27), incorporating the Blackstone Canal Company, without limitation of duration, for the purpose of constructing a canal from Worcester to the line of the State of Rhode Island; and, in the same year, the General Assembly of Rhode Island passed an act incorporating the Blackstone Canal Company, in that State, for the purpose of constructing a canal from Providence, to connect with the canal authorized by the State of Massachusetts. canal companies, though never amalgamated, were associated in the manner mentioned in their respective charters, and in sundry acts subsequently passed in addition thereto; and canals were constructed accordingly, which were connected together by the boundary of the two States, and formed one continuous line of canal from Worcester in this State to Providence in Rhode Island.

"The second section of the act above mentioned, to incorporate the Blackstone Canal Company, in this State, authorized the corporation thereby established to locate, construct, and fully complete a navigable canal, with locks, tow-paths, business wharves, dams, embankments, toll-houses and other necessary appendages, commencing in or near the village of Worcester, and from thence down the valley of the Blackstone river, in a direction towards tide-water," etc.

"The fourth section authorized the corporation to purchase and hold real estate, not exceeding the value of three hundred thousand dollars, and to erect mills and other works on the waters connected with the canals, feeders, and reser-

voirs.

"The eighth section provided that when the canal company should have located their canal, or any part thereof, they should report the same to the Court of Sessions, by whom commissioners should thereupon be appointed to estimate all damages which any person or persons, whose lands should be described and mentioned in such report, might sus-

tain," etc.

"The deed provided that so much of the canal as should not be used and appropriated in the construction of the railroad or for railroad purposes, should remain the property of the grantors, except so far as might revert to the original owners of the land by operation of law; the reservoir owned by the grantors in Massachusetts, with the land and dams belonging thereto, the waters contained therein, the dams erected or raised on the Blackstone river by the grantors, and the waters in the river retained by such dams, are expressly reserved by the grantors to themselves without being affected in any way by the conveyance; and the deed further pro-

vided that the rights and privileges which any person or persons had acquired, or then possessed, to draw or conduct water through the canal in Massachusetts, for mill purposes, irrigation, or otherwise, should not be injured or affected by the conveyance; but that such rights and privileges should be and remain uninjured, and in full force.

"B. R. Curtis, for the petitioner.

"P. C. Bacon and J. M. Barton,
for the respondents.

"Shaw, C. J."

The argument of Mr. Curtis for the petitioner is worth reading, to say the least.

"If the transaction were a plain and simple one, which the argument seems to imply; if there were no identity or communion of right and interest between the mill-owners and the Canal Company; if the company had been authorized to take and use water, and erect dams and water-works, for the purpose only of constructing a navigable canal and keeping it in operation; if that object and purpose had been abandoned, and the actual use of the water had been discontinued by the company, without any reservation or saving of rights,—there would have been much plausibility in this argument, although the result would be to give the plaintiff a double

compensation for one and the same loss.

In the present case the company have acquired this dam, and adopted it for the purpose both of making a section of the canal, and also of establishing it as a reservoir, obtained with it the right to the mill-power as incidental, which they could use when disposed of for a certain term of time or in perpetuity. If they made arrangements with the proprietors, by which the company were to pay the damages occasioned by the dam, or for the cost of the dam itself, to have the use of the pond, for a section of the canal, with a tow-path on its margin, and also for a reservoir, and the proprietors to have the mill-power and mill privilege, these respective rights, mutually conceded, must be regarded as considerations for each other, and the mill privilege to be held in subordination to the right of the company, and no longer upon an independent title. Otherwise, the dam and reservoir could not be 'established' as works erected and maintained in pursuance of the powers vested in the company by the act, and the mill owners might prostrate the dam at their pleasure. This is wholly inconsistent with the facts agreed to, to wit, that the company did adopt the dam as theirs, paid the damages occasioned by it, and established the pond raised by it as their reservoir, under the act.

The result of this view is, that the company had the right to maintain this dam, to raise a head of water both to supply the navigable canal and also to work mills; that they adopted this dam, then recently built, established the pond as a reservoir, and gave notice of it according to law, so that the claim for damages on the part of any owner, whose lands were flowed by it, was a claim for all the damage occasioned by the use of the company's franchise, and, of course, embraced all damage done to the complainant's land by flowing, for all the uses of the water to which the company had a right to apply it, including as well the mill-power as the supply of the canal with water. The damages, therefore, now sought to be recovered, have been paid by the canal company, under whom the respondents virtually hold their mill-power.

This appears to be the ground upon which the complainant acted at the time. If the canal company and the millowners were wholly independent of each other, — if the complainant went for and obtained damage from the canal company, for raising and using the water for supplying the canal only, and the raising of it for mills was another and different use not compensated for by those damages, - his claim against the mill-owners was as good then as now. But he did not so consider it, and therefore made his claim against the canal company, and not against the mill-owners. And, in our opinion, this was right. In theory of law, his claim was for damage done to his lands, by the erection of a dam for all the purposes within the franchise granted to the company, which was to raise water and use it for the supply of the canal, and for working mills; and of course such were the damages awarded and paid. The complainant having thus claimed and received a full compensation for a perpetual easement to flow his lands, for the purposes of a public or quasi public nature, equity corresponds with the law in declaring him not entitled to a further compensation.

II. But it is further argued, and perhaps this may be regarded as the main point relied upon, that the mill privileges were merely incidental to the maintenance of the canal for navigation; that the canal, having been abandoned by the company, and navigation therein having become impracticable by the filling up of a portion of it, the mill privileges and all derivative and dependent rights are gone. If the fact were true, it might be quite questionable whether the conclusions, to the extent stated, would follow. If, before such an abandonment, the company had acquired a mill

privilege, as they lawfully might, and had alienated it by a valid conveyance to another, whose right would therefore become vested, it may be doubted whether even a forfeiture of its franchises by the company, by a judgment, would defeat the right of an alienee taking under such title, valid at the time it was made.

But passing over this consideration, with the above remark only, we are to consider the nature of this alleged abandonment, and its legal effect. It is true, that the use of the canal, as a navigable canal, has been discontinued so far as the same was in Massachusetts, and the company have sold to the railroad corporation the bed of their canal; but this was done under the express enactment of the Legislature, authorizing such sale, and declaring that it should not work a forfeiture. St. 1844, c. 166.

This act is short, but very significant and efficacious. Its avowed purpose is to facilitate the construction of a railroad between Worcester and Providence, as a substitute for the canal; it authorizes the canal company to make sale of their entire property, or any part or portion thereof, and to convey the same to any purchaser or purchasers; which conveyance shall vest a good title to such property, though a change of

use to other public purposes may follow such sale.

This grant provides, and indeed the whole act was founded on a principle which has been decided in this Commonwealth, but is now well settled, that where, under the authority of the legislature, in virtue of the sovereign power of eminent domain, private property has been taken for a public use, and a full compensation for a perpetual easement in the land has been paid to the owner therefor, and afterwards the land is appropriated to a public use of a like kind, as where a turnpike has by law been converted into a common highway, no new claim for compensation can be sustained by the owner of the land over which it passes.

It may be admitted, in the present case, that this last purpose was incidental, subordinate, and applied only to heads of water, raised for the more prominent purpose of supply-

ing the canal.

Property which has been purchased and paid for by the company, and which, by the failure of the main enterprise, had become unnecessary to its promotion, and which could be disposed of by the company, without injustice to anybody, was obviously of this description. Of the equity of this rule, as applied to ordinary articles of property, such as boats, materials of buildings removed, and the like, there could be no doubt. And we think that valuable mill-powers, mill privileges and reservoirs, lawfully acquired by the com-

pany, within the scope of their authority, and obtained by the outlay of their own capital, though in their nature fixed and immovable, come within the same principle; and that it was competent for the legislature to secure the benefit of them to the company, and to provide for their continued corporate existence for the preservation and management of such articles, or the sale and disposition of them, and that

they have done so by the act in question.

It is scarcely necessary to add, that regarding a mill-privilege as a valuable property, capable of being conveyed and disposed of, it necessarily embraces the use of the head of water raised for working the mills, and the right of flowing as incidental; that when such flowing extends over the lands of another, it is an easement to such lands annexed to the privilege; and that when gross damages have been paid, by the owner of the mill to the owner of the land, for a perpetual easement, the mill privilege carries with it such easement and right of flowing, free from all further claim for damages occasioned by such flowing.

The court are of the opinion, and do adjudge, that the complainant is not entitled to damages as prayed for, and

that the complaint be dismissed."

Now, I agree that if the legislature had authorized the Middlesex Canal to sell any of their land, which they held as incidental to their canal, they might do so, and will do so, because the legislature have a right to deal with all public property. But here, in this case, there is no such authority granted or given whatever; and, on the contrary, the parties claimed that they held subject to a reservation to the canal; and the whole power in the canal property is in the canal corporation, until it is lawfully discontinued. Discontinued by whom? Why, discontinued by an act of the legislature agreeing to its discontinuance, - not by forfeiture of all powers and franchise, which they had at that time. And we find, may it please your Honors, in the seventh of Gray, that at that very time a petition was being prosecuted before the Supreme court, for the purpose of allowing the canal company to discontinue, which petition was afterwards dismissed, as we learn in the Middlesex Canal company's case.

Mr. Abbott. That petition to be dissolved, was dismissed upon the ground that the statute did not apply to that clas of

corporations.

Mr. Butler. That was in 1864. It was dismissed without costs. Here is the petition in my hand, and, perhaps, for convenience of reference, it will be well to have it printed in these proceedings, as an appendix to my argument,

Mr. Abbott. The petition to dissolve was commenced previous to the petition to forfeit.

Mr. Butler. The petition was filed somewhere in 1852,

I believe.

Mr. Abbott. I should think later than that.

Mr. BUTLER. It is the March term, 1852. You will find it here. It was pending all that while.

Commissioner Russell. There was no opinion of the full court there, was there?

Mr. Abbott. No, sir.

Mr. Butler. It may be instructive to see what ground was taken here.

Your Honors will perceive that this petition thereupon remained. The canal remained undiscontinued, until these rights were forfeited by judgment of the court, and the action of the legislature; and all its rights, franchises and privileges were seized to the Commonwealth.

Now, then, your Honors have before you the exact state of this title. And the first question is: Has Mr. Talbot taken any title from the Middlesex Canal, by the deed? Did he take the title by the deed? That wholly depends upon the power of the corporation to convey.

[Recess till 1\frac{1}{2} o'clock, P. M.]

AFTERNOON SESSION.

I was saying at the adjournment, may it please your Honors that the title of the petitioners depends, first, upon the power of the Middlesex proprietors to sell at all; second, upon the power to sell in the manner that they did; and third, upon the effect of the reservation in their deed. We claim that they had no power, without an authorization from the legislature, to sell that which was vital to the use of their canal, if they did sell it; and sub-modo by a deed signed by their president and treasurer, and a majority of their directors. It being a matter vital to the existence of the canal, certainly it could not be done without a vote of the stockholders, — which nowhere appears. Secondly, all the real estate acquired by the canal being sui generis real estate, and being divided as real estate among their shareholders, it could not be sold, of course, without some action of the shareholders.

Mr. Abbott. I did not understand that any question was to be made as to these conveyances, which affect the existence of the company, when the corporation voted that the directors might sell out, and the directors voted that they would sell.

Mr. Butler. I wish you would put in those votes. I do not wish to get from your Honors a judgment which, afterwards, upon the production of some new fact, might be liable to be overruled.

Mr. Abbott. I will show them to you, sir.

Mr. Butler. Please do so at any time before these hear-

ings are closed.

But then my proposition is, that if I owned real estate in conjunction with a majority of my associates, a majority of those associates cannot sell this real estate. All this real estate, by the act of incorporation, was to be divided into shares, held as real estate, except for certain specific pur-

poses; and that is set up in the answer.

Now, may it please your Honors, I have gone over and have caused to be gone over all the authorities that I can find in this country upon this question, first commencing with those in our own reports and then following those up by those to be found in the several State reports. They are contained in this brief, - which with your Honors' leave I will have printed, and not read. They fully establish, in my judgment, this proposition, — that a corporation have no power to sell any portion of their franchises necessary and requisite to carrying out the object of their corporate existence. It is expressed that they have no other rights of property except for the purpose of their corporate duties. And here it is very clear that this property was perfectly vital. Suppose they had been called upon to keep up their canal and transport goods, would they have been allowed to say, "Why, we have sold the water-power and we cannot fill our canal "? Clearly not. It is expressed by Chief Justice Taney, in Perrine vs. Chesapeake and Delaware Canal Co., in the 9th of Howard, p. 184, in these words:—

"Now it is the well settled doctrine of this court that a corporation created by statute is a mere creature of the law, and can exercise no powers except those which the law con-

fers upon it or which are incident to its existence.

".... The error in this argument consists in regarding the title of the company to the property in question as derived to them upon common law principles, and measuring their rights by the rules of the common law. The corporation has no rights of property except those derived from the provisions of the charter, nor can it exercise any powers over the property it holds except those with which the charter has clothed it. It holds the property only for the purposes for which it was permitted to acquire it, — that is, to effectuate the objects for which the legislature created it." Vide Head & Emory vs. The Providence Ins. Co., 2

Cranch, 127; Dartmouth College vs. Woodward, 4 Wheat., 636; Bank of U. S. vs. Dandridge, 12 Wheat., 64; Charles

River Bridge vs. Warren Bridge, 11 Pet., 544.

That was also decided in Commonwealth vs. Smith et als., in the 10th of Allen, 455, — a case with which I know the chairman is familiar, because at another time and place we had to examine it pretty carefully as to the rights of a railroad corporation to mortgage.

Again, according to the 4th of Peters, 162, -

"This mill property can not be separated from the canal. By the strict interpretation of the acts above referred to, they are one and the same. 'The exercise of the corporate franchise being restrictive of individual rights, cannot be extended beyond the *letter* and *spirit* of the act of incorporation.'" 4 Pet., 162.

And that is sustained by a series of cases which I have cited.

So without going into this class of cases I propose simply to print this brief, which will give you all the authorities, and the vital portions of the decisions written out, as being in a more convenient form to refer you to books which you have got hereafter to have with you. Everything that proposes itself to have been copied I believe to have been copied correctly.

By an act passed June 22, 1793, the legislature incorporated James Sullivan et als. proprietors of the Middlesex Canal, for the purpose of cutting a canal from the waters of the Merrimac river into the waters of the Medford river.

The State delegated the right of eminent domain, as in the case of turnpikes; the land and water-rights of individuals were taken.

The corporation was "authorized and empowered to purchase and hold, to them and their successors forever, so much land and real estate as may be necessary for the purposes aforesaid, not exceeding," etc.

By an act passed February 28, 1795, the said corporation "was empowered to receive and hold real estate, as appendant to the same canal and for the purpose of facilitating the business of the same, to the value of £30,000 over and above the value of the canal simply considered."

In addition, the proprietors were empowered to make the Concord river boatable as far up as Sudbury causeway; to cut a canal

around Dunstable, etc.

By an act passed June 25, 1798, after reciting the "real estate" clause in the act of 1795, goes on to state that the proprietors "having expressed their doubts whether in virtue of said act they may erect and hold mills on the same canal, and on the waters with which it is or shall be connected,"

Be it enacted, etc., that "the corporation of the Middlesex Canal,

or the proprietors of the said canal in their corporate capacity, shall have power to purchase and hold any mill-seats on the waters connected with the same canal and lands to accommodate the same, and thereon to erect mills. . . And provided also that all the mill-seats and land purchased or received by the said corporaation shall not exceed the sum of £130,000." (Obviously the same as the £30,000 clause in act of 1795.)

The mill property is to be taxed the same as the canal, wharves,

towing-paths, etc., mentioned in acts of 1793 and 1795.

A charter of incorporation must be construed strictly.

A charter of incorporation must be construed in favor of the public and against the grantees. Contra adend. Black, C. J.,

27 Penn., 339.

"The corporation has no rights of property except those derived from the provisions of the charter, nor can it exercise any powers over the property it holds except those with which the charter has clothed it. It holds the property only for the purpose for which it was permitted to acquire it,—that is, to effectuate the objects for which the legislature created it." Taney, C. J., in Perrine vs. Chesapeake & Delaware Canal Co., 9 Howard, 184; vide Heade et al. vs. Providence Insurance Co., 2 Cranch, 127; Dartmouth College vs. Woodward, 4 Wheat., 636; Bank of U. S. vs. Dandridge, 12 Wheat., 64; Charles River Bridge vs. Warren Bridge, 11 Pet., 544.

The act of 1793 empowered the proprietors to cut a canal and do such other things as were necessary to that end. The act of 1798 authorized and empowered the corporation to take and hold mill seats. Certainly these were appendant to the canal and for the purpose of increasing the business and trade thereof. These

were additional corporate powers.

Additional corporate powers may be granted enlarging franchises already possessed, such as granting to a bridge company the privilege of laying out a turnpike road to be used as a feeder to the bridge. Commonwealth vs. Hancock Free Bridge Co., 2 Gray, 64; Canal Bridge vs. Gordon, 1 Pick., 297; Willink vs.

Morris Canal, 3 Green, ch. 377.

This mill property cannot be separated from the canal. By the strict interpretation of the acts above referred to they are one and the same. "The exercise of the corporate franchise being restrictive of individual rights, cannot be extended beyond the *letter* and spirit of the act of incorporation." 4 Pet., 162; 1 Cowen, 686; 5 Seld., 444; 16 Ohio, 97; 18 Ohio, 151; 21 Penn., 9; 27 Penn., 339.

The Middlesex Canal Company erected mills and used the "surplus" water not needed for the purposes of the canal in running the mills. Suppose after the sale of the mills the trade of the canal had increased to such an extent that all the water was needed for the purposes of the canal, — wouldn't the mills have to stop? Could the proprietors of the canal, to the great inconvenience and damage of the public, refuse to transport goods and passengers, and would the excuse that they were obliged to supply the mills be a good and valid one as against the charter?

If then the mills were appendent to the canal, and the act of 1798 was but the enlargement of the original franchise, it follows that the mill property could never have been sold, or, in other words, that the present proprietors have no claim to the waterrights (leaving out the question of alienation of the land), because the right to the use of the water of the Merrimac and other rivers was a franchise.

"The right of flowage is a franchise." Shaw, J., Boston Water

Power Co. vs. B. & W. Railroad, 16 Pick., 522.

"You cannot declare a franchise lost, or cannot take it away, except at the instance of the Government." Black, J., in Erie Railway Company vs. Casey, 26 Penn., (S.) 289.

And,

"If there are certain immunities and privileges in which the public have an interest, as contra-distinguished from private rights, and which cannot be exercised without authority derived from the sovereign power, it would seem that such privileges and immunities must be franchises." The People vs. Utica Insurance Co., 15 Johns., 358.

Then the right to take the waters of the Merrimac is a franchise. But the water taken turned the mill-wheels and is the right under which the present owners claim. It was granted as a franchise to

the proprietors of the Middlesex Canal. But,

"A franchise cannot be sold." 24 How., 257; 21 Law Rep., 138; 9 Sm. & M., 431; 40 Mo., 140; 5 Ind., 306.

And,

The franchise cannot pass except by authority of special statute. State vs. Ivers, 5 Ind., 305; 11 Ala., 437; 13 Serg. & R., 210; 12 Barb., 460; 8 Smedes & Marsh., 394; 10 Johns., 389.

And if the canal, wharves, towing-paths, mills and mill-seats

were under the same franchise -

"Are not the property and franchise of a public corporation an entire thing?" Farmers Loan and Trust Co. vs. Hendrickson, N. Y. Sup. Court, 1858.

The right of a ferry is such a franchise, and the boats required for the transportation of goods and passengers are inseparable

from the franchise.

Corporations may sell or mortgage their personal property, but they cannot sell or mortgage with it the right to manage and control the road nor any other corporate right or franchise. King vs. Severn & Wye Railway Co., 2 B. & Ald., 646; Reg. vs. Eastern Counties Railway, 10 Ad. & Ellis, 531; Reg. vs. South Wales Railway Co., 13 Ad. & Ellis, (N. S.) 902; Clark vs. Washington, 12 Wheat., 46 and 54; Winchester & Lex. Turn. R. Co. vs. Vimont, 5 B. Monroe, 1; 9 Smedes & Marsh., 395.

But if the right to take water for canal purposes is not a franchise, it was granted by the State by the right of eminent domain; and Foster, J., in Hinds et al. vs. Pinkerton, 14 Allen, 386, said a railroad company "can sell and convey whatever property it may hold, not acquired under the delegated right of eminent domain, or so connected with the franchise to operate and manage a railroad that the alienation would tend to disable the corpora-

tion from performing the public duties imposed upon it in consideration of which its chartered privileges have been conferred."

The estate remaining in a corporation at the time of its dissolution reverts to the original grantor. Angel & Ames on Corp., 164; 5 Ind., 305, 309; 12 Barb., 460; 4 Halst., (ch.) 277, 292.

Then we come to another question, which is quite vital to this matter. That deed is a quitclaim deed, reserving all the water forever for the uses of the canal. And if the deed was not *ultra vires*, if it was duly executed, then, I say, it does not convey the water, because it reserves the water forever for the purposes of a canal, *i. e.*, for the purposes of a highway. I don't know that I need trouble your Honors

farther upon this point.

We now come to the question of damages; and I desire to call your Honors' attention to one or two propositions that have been made here. There is no evidence, and there is no reason to suppose that the water-shed of the Sudbury river is more productive than any other equal area of water-shed. There has no finical reason been put in, and there has no evidence been put in to that effect. Then to what are these petitions entitled? They are entitled only to the natural run of the stream, i.e., the stream in a state of nature; not what it may have been made by other people's dams, which they do not own. That was decided in the Cochituate water cases in 1847. And my brother Abbott, being a good lawer, has not asked for any more in his petition. It says:—

"And your petitioners further say, that Sudbury river, so called, in said Commonwealth, is one of the natural sources and tributaries of said Concord river and the waters thereof one and the principal means of supply of said Concord river, and that the waters of said Sudbury river, when undisturbed and unobstructed and left to their natural course and current, flow into the said Concord river above the lands, mills and factories of your petitioners before described, and through and by means of the said Concord river, naturally flow and pass by and through the lands, mills, and factories of your petitioners, and furnish power for running and operating the same, and are of great value to and advantage to your petitioners."

Then they go on and say, that the City of Boston have, by said obstructions, "diverted the said waters from their natural and accustomed flow into the said Concord river." They then proceed as follows:—

"And said petitioners further say that by means of said permanent obstruction of the natural flow, current, and course of the

waters of the said Sudbury river and Farm pond, and the taking, withdrawal, and diverting thereof as aforesaid from their natural and accustomed flow, and by reason and means also of the said permanent obstruction, dam and erections, which the said City of Boston has built and erected as aforesaid, and still maintains, the waters of said Sudbury river and Farm pond do not and cannot now and will never hereafter flow, as they did and would naturally, into the said Concord river."

So they do not claim anything but the flow of Concord river, which I think is the law.

Now, my brother undertakes, by means of bringing a man who remembers how many horse-power were run at Saxonville, to show that one-fifth was equal to 50, or 80, or 90 (I could not get at exactly what the witness meant to say) horse-power during the dry season. That cannot be so. I will tell you why it cannot be so. It is in evidence that, during the year 1872, we took all the water of Sudbury river down into Lake Cochituate, and it amounted to only seven millions of gallons per day. That is the first fact; and it is not by any means shown by the rain-guages, that that was an exceptional dry season, like the present one. And now I am dealing with all the flow given by the great accumulations of the reservoirs and dams above.

Mr. Abbott. Where is the evidence that there was any

measurement of the water taken by the City?

Mr. Butler. In the City's report you will find that they gauged it.

Mr. Abbott. I have never heard one particle of evidence

upon that subject.

Mr. Child. It is in a passage that was read from the report for 1876, stating how much they took.

Mr. Butler. It has been gone over, and I have argued it at least twice, and it has got to be an old story with me.

Mr. Abbott. Whether they took all the water or not is what I enquired.

Mr. Butler. Oh, yes, sir. They took all they had, and wanted more. They took what there was at a certain time, and it amounted to that average. But I do not ground myself there. The Faulkners' running their steam-engine does not show but what Mr. Talbot's mill substantially uses all the water in the dry season; and he does not use, at most, but about 187 horse-power. And he has, not only the water-shed of the Sudbury above Saxonville, but some 75 miles of the water-shed of the Sudbury below Saxonville, in addition to the Assabet and the other branches of the Concord.

Now, it is said that there is but one-fifth of the water supplied, and that therefore it cannot be taken, — less all there

is of soakage, drainage and evaporation. Now, there is not a man of you that does not know that it is not possible, that there can be any such price per horse-power, by steam, as was given by the witness from here in Boston. It is in evidence before you that the Wamesit Power Company let their power, furnishing mills, wheels and everything, to the very pulleys, for seventy-five dollars per horse-power per year, — and they expect to supplement it with steam in the dry season; and arrangements are made for doing it. And they get a profit out of that, over and above what it costs.

Now, there is one other consideration only, that I want to call your attention to, and that is this: Mr. Talbot bought this property in 1851. The Essex Company were in operation in 1849. They are selling horse-power for twenty dollars a horse-power a year, and they have been ever since, at that place, in every possible amount, from one twelfth of a mill-power, or from a few horse-power, up to any amount.

That establishes a market in the very neighborhood. It is no answer to say, that they want to sell their lands. They sell to others; and corporations that have got all their mills established, including their boarding-house, and everything else connected with the works. They sell in the littlest amounts (which would not affect their lands at all) for twenty dollars a year per horse-power. Well, now, I appeal to you, gentlemen, as men of experience, to say, if you do not know that that is a higher rate than any other corporation, - either the Turner's Falls, the Holyoke, or any other corporation sells it for. You can get it any and everywhere for less. And the price of water-power has not advanced, It is the same. The Essex Company did not ask any more for it than they did in 1849, and they have got plenty to sell. Now, what is the rule? It is the market price, is it not, if you want a rule, - for what a man loses, but, it not having advanced, I call your attention to a sale here. Mr. Talbot buys all this land, - twenty-nine and some odd acres, all the mills and water-power, and all the dams that he has got now, when water-power was worth as much as it is now, for \$20,000. He buys the whole of it for that. Well, my brother, says: "That is Mr. Talbot's good bargain." Well, I am content to say that he made a good bargain. He usually does, when he can do it fairly. He is a man of shrewdness and business capacity. But somebody sold it at the same time, didn't they? Don't you suppose they wanted the market price? Is it not evidence of the market price at that time?

Now, how much are we to pay for taking, say one-fifth of that water-power? You are to deal with the question as

practical men. You are to answer on your consciences and judgments as practical men. Mr. Talbot buys a water-power in 1851, when water-power was just as dear as it is now, and no dearer, — when water-power is worth just as much as it is now, and no more and no less; and he buys a whole establishment, dealing with a public corporation, for \$20,000, and twenty-nine acres of land besides! Are you going to give him \$100,000, for one-fifth of it, or \$200,000? I trow not! You never can look yourselves in the face in the glass again, I respectfully submit, much less look your fellowcitizens in the face, if such an award shall be made. It is not the way men deal. It is not the way that men hold their property. I understand that a man can buy the land, as the Essex Company did, and create a water-power, and bring their lands up, and it is not to be said to them "why, you bought it cheap, and it is worth a great deal by the rise of the land." But the gentleman bought the water-power at that time, and it has not grown any more valuable in the market. Within six miles of them you can buy water-power, just as much as you please, steady, perpetual, kept up for \$20 a horse-power a year. How much are you to give them? And how much are you to give when we do not take that water-power, so bought for \$20,000, but one-fifth of it: so as to injure them, upon the very fair, just and proper statement of Mr. Talbot, only to the extent of one-fifth of it? It does not trouble them more than three months in the year, one-quarter of one-fifth is one-twentieth, as I understand it. You see these gentlemen have got their ideas very much inflated. not do to allow a man to value his own property.

Now I have given you these few practical suggestions. I am not going into the argument of water-sheds, or rain gauges, or rain measurements. This is the reason why I have put in no measurements, because I am quite satisfied with the showing, as these gentlemen make it, when it is

fairly and justly considered.

Now, gentlemen, one other point and I will relieve you. I have over and over again taken the point before you that this statute, that the parties must fail to agree before they shall be sued, means something. There is no surprise upon my brother, because I gave him notice while his case was going on. And not only has there not been a scintilla of proof that they ever called upon the city so that the city could pay, but in their petition they do not set an ad damnum, that we might make a tender. They leave it in the indefinite imagination of some man that they can get, who runs a small machine-shop down in Haymarket square. They nowhere put in an ad damnum in their complaint, and

say "to the damage so much;" and I guess if my brother was put upon the stand, when the commissioners went up to take a view (I was not there, and so I can only "guess"), it will turn out that they asked him to set a price, and he was so modest that he would not. He was afraid that he should set it too low, I suppose. But, however, that is not before you,—

Mr. Abbott. It is pretty good evidence that we could

not agree then.

Mr. Butler. Pardon me; "You could not agree!" An agreement means that one man shall make a demand on the other, who shall accede to or reject it. But if a man will not make any demand at all, there is no disagreement about it.

That is not in the meaning of the statute.

Now this is not merely formal, let me say once more,—because here is land taken for a great public use. It is for the benefit of all,—because we are all interested in the city of Boston. It is for the benefit of the public. And it is also for the benefit of all that there should be no more litigation about this than is necessary, and that the agents of the public should be entitled at least to have information as to anybody that claims to be injured,—they operating over a territory 160 or 170 miles square, and not knowing whom they did, could, or might injure. Before they are sued and put to expense, they should at least have a man come to them and say, "You injure me, and I think about so much,"—so that they may make an adjustment, or have their attention called to the injury. And that was what was the meaning of the statute.

Gentlemen, the case is before you. I do not believe that I can aid you any farther by anything I may say. I am sorry I have trespassed upon your time so long; but these questions which I have suggested this morning are very vital, and very important, and there are certain corollaries from them, I think; and one is, that if this water was taken by the Essex Canal Company and carried to Boston, it was paid for, and having been once paid for, for the public use, why then it comes within every decided case, and especially the case of Chase vs. Sutton, that it cannot be paid for over again, when devoted to another public use.

In Commonwealth vs. Smith et als. 10 Allen, 455.

Bill in equity seeking to impeach the validity of a mortgage covering by its terms the franchise, railroad and all other property of the corporation, etc.

Hoar, J. A corporation having the capacity to sue and be sued, the right to make contracts, under which it may incur debts, and the right to make and use a comman seal, a contract under seal is not only within the scope of its powers, but was originally the usual and peculiarly appropriate form of corporate agreement.

The general power to dispose of and alienate its property is also incidental to every corporation not restricted in this respect by express legislation or by "the purposes for which it is created, and the nature of the duties and liabilities imposed by its charter."

But in the case of a railroad company created for the express and sole purpose of constructing, owning and managing a railroad; authorized to take land for this public purpose under the right of eminent domain; whose powers are to be exercised, by officers expressly designated by statute; having public duties, the discharge of which is the leading object of its creation, etc., — there are great, and, in our opinion, insuperable objections to the doctrine that its franchise can be alienated and its powers and privileges conferred by its own act upon another person or body, without authority other than that derived from the fact of its own incorporation, The franchise to be a corporation, clearly, cannot be transferred by any corporate body of its own will. Such a franchise is not in its own nature, transmissible. The power to mortgage can only be coextensive with the power to alienate absolutely, because every mortgage may become an absolute conveyance by foreclosure. although the franchise to exist as a corporation is distinguishable from the franchises to be enjoyed and used by the corporation after its creation, yet the transfer of the latter differs essentially from the mere alienation of ordinary corporate property. The right of a railroad company to continue in being depends upon the performance of its public duties. Having once established its road, if that and its franchise of managing, using and taking tolls or fares upon the same are alienated, its whole power to perform its most important functions is at an end. A manufacturing company may sell its mill, and buy another; but a railroad corporation cannot make a new railroad at its pleasure.

In Richardson et als vs. Sibley, 10 Allen, 67.

A street railway corporation has no power to mortgage its franchise, road or property without legislative authority; and under stat. 1864, ch. 229, a mortgage by such corporation of substantially all of its property without such authority is wholly void.

Gray, J. A corporation has no power to do any acts which the legislature has expressly or by necessary implication prohibited it from doing. A corporation created for the very purpose of constructing, owning and managing a railroad for the accommodation and benefit of the public, cannot, without distinct legislative authority, make any alienation, absolute or conditional, either of the general franchise to be a corporation, or of the subordinate franchise to manage and carry on its corporate business, without which its franchise to be a corporation can have little more than a nominal existence." Shrewsbury & Birmingham Railway vs. London & Northwestern Railway, 6 H. Seas., 136, 137; York & Maryland Line Railroad vs. Winans, 17 How. 39; Worcester vs. Western Railroad, 4 Met. 566; Commonwealth vs. Smith, 10 Allen, 455, 456.

In Spencer et als. vs. Pinkerton, 14 Allen, 386.

Bill in equity brought by trustees under a mortgage issued by the Grand Junction R.R. and Depot Company, as security for certain lands of said company, to compel the defendant specially to perform his written agreement to accept and pay for certain lands in East Boston, bid off by him at auction. At the date of the mortgage referred to, the company held large tracts of land in East Boston, upon which it was engaged in building wharves and warehouses for storage, etc. These lands were not required for the railroad track or for other railroad purposes.

Foster, J. We entertain no doubt that the Grand Junction R.R. and Depot Co. could lawfully sell and convey the lands embraced in this bill. They were not acquired to enable the corporation to carry on the business which it was chartered to do for the benefit of the public, nor needed or used for that purpose. Their alienation in no wise impaired or affected the usefulness of the company as a railroad or its ability to exercise any of its corporate franchises. The recent cases in which railroad mort-

gages have been adjudged invalid by this Court do not countenance any doubt of the power of a railroad company to sell and convey whatever property it may hold, not acquired under the delegated right of eminent domain, or so connected with the franchise to operate and manage a railroad that the alienation would tend to disable the corporation from performing the public duties imposed upon it in consideration of which its chartered privileges have been conferred.

The special permission of the act relative to this company contemplates the acquisition of lands for sale or lease to other railroads, and the parcels included in the bill are agreed to have been purchased for such purposes, and not for the corporation in its own

railroad business.

In Boston Water Power Co. vs. Boston & Worcester R.R. Corp., 16 Pick., 522.

Shaw, C. J. But the right of making use of the land of others, whether it be that of the public or of individuals, for a precise and definite purpose, not inconsistent with a general right of property in the owner, especially where it is for a public use, is in legal contemplation an easement or franchise, and not a grant of the soil or general property.

And upon the best consideration which we have been able to give to these statutes, the Court are all of opinion that, so far as the right of flowage is concerned, the right conferred was a franchise.

It seems to be no valid objection to this view of the case, that the easement is of such a character as to deprive the owner of all useful or available beneficial interest in the land. In case of land appropriated to the use of a turnpike corporation, although the corporation obtains the entire use of the surface of the land, as well for use as a travelling path, as for collecting gravel, earth, materials for constructing it, and although in point of fact in assessing damages for the owner in such a case, the whole value of the land is usually gain, dedicating nothing for the general right of ownership, yet it is clearly held that such right of property in the original owner is not divested; the right of the corporation is an easement only.

In Dudley Adams vs. Billy Emerson, 6 Pick., 57.

The owner of the soil over which a turnpike road is laid out may maintain tresspass against the servant of the corporation for

taking the herbage.

Wilde, J. The locus in quo, although part of a turnpike road, is the soil and freehold of the plaintiff. He has the exclusive right of property in the land, subject, however, to the easement or rights incident to a public highway, such as the right of passage over it, and the right which the turnpike corporation has to construct a convenient pathway, and to keep it always in good repair. To accomplish these purposes, the corporation may dig up and remove from place to place, within the limits laid out for the road, any earth, sand and gravel, and may dig or cut up sods and turf; but it by no means follows that the corporation has the right of herbage, which is the exclusive property of the owner of the soil, as well as all trees, mines, etc. The corporation has no right of property in the land, but only a servitude or easement, and this does not clash with the plaintiff's exclusive right of property in the land, so that there is no pretence for saying that the plaintiff and the corporation are tenants in common. Vide 6 Mass., 454; 16 Mass., 33; 4 Mass., 427; 13 Mass., 257.

Hooker vs. Utica and Minden Turnpike Road Company, 12

Wend., 371.

A turnpike road company neglected to finish the construction of their road within the time limited by their charter; they abandoned a portion of it and permitted the owners of lands through which it passed to enclose the same. The company have no right to sue for penalties for injuries, etc., to that portion not occupied by them, although the company went into operation, constructed a portion of the road, were permitted to erect a gate, and had the damages of the owners of the lands through which the road was laid duly appraised. It seems that the title to the land over which the road passes vested in the company, is vested solely for the purposes of a road, and that when the road is abandoned the land reverts to the original owners.

Nelson J. Although the act of incorporation vests in the company the title to the lands over which the road passes, on compliance by them with the provisions of the act, such title must nevertheless be considered as vested only for the purposes of a road, and when the

road is abandoned, the land reverts to the original owners.

And vide Canal Company vs. Railroad Company. 4 Gill and J., 1.

Peirce et al. vs. Somersworth et al., 10 N. H., 369.

Where a highway is laid over a turnpike road, and the easement or franchise of the corporation is taken, it is not necessary to notify the owners of the land over which the turnpike road was established. Having been paid for a perpetual easement, or right of passage for the public, they have no claim for further compensation merely because the right of passage is discharged from a tax or toll.

Parker, C. J. There was no necessity of notifying the owners of the land over which the turnpike road had been previously

The establishment of that road gave the corporation an easement in the land thus taken for the public travel; and if the highway is laid over the same ground only, nothing is taken by it but that easement. The easement, in which the turnpike corporation had a private interest, but which was devoted to the use of the public, subject to the payment of a toll to the corporation, is taken by the highway for the public use, discharged and exempted from the toll; but in this matter the owners of the land over which the turnpike road passed have no interest. They are not damnified by the change. The turnpike corporation had taken and held a perpetual right of passage for the public. The conversion of this into a free right of passage, or, in other words, the taking of this easement and franchise for the free use of the public, is a damage to the corporation, but the rights of the landholders have thereby undergone no change. the owners of the land are concerned, it is a substitution of a public right for a right previously existing, partly public and partly private, but which was coextensive, in its limits and duration with that which is substituted. If a discontinuance of the turnpike road would have restored the owners to the possession of the land, so will a discontinuance of the highway, and there is nothing to show that the one is more likely to happen at an early day than the other. If there was, it would not alter the nature of the property. The owners have been paid for a perpetual easement or right of passage for the public, and have no claim for further compensation merely because the right of passage is discharged from a tax upon it to the corporation.

respondents; and its truth, therefore, need not be inquired into here. The turnpike corporation was duly constituted, have constructed the road, and are in full occupation of the franchise and easement. If they have neglected to comply with any provisions of the charter, imposing upon them the duty of making subsequent returns, a forfeiture can be enforced by the government alone. If the government waive the right to exact a forfeiture, individuals cannot show and rely upon it. 5 Mass., 232; 7 Conn.,

46; 6 Cowen's, 23.

The Queen on the prosecution of the Llanelly Railway and Dock

Co. vs. The South Wales Railroad Co., 14 Q. B., 902.

The South Wales Railway Company, having power to take and purchase lands, and to construct a railway according to the plans and books of reference deposited under their act, gave notice to the Llanelly Railway and Dock Company that they (The South Wales Railroad Company) required to purchase a small piece of land, on part of which the Llanelly Railway was actually constructed, such piece of land being set out in the said plans and books of reference as part of the proposed line of the South Wales Railway, but they afterwards refused to issue their warrant to the sheriff to assess the amount of purchase money, on the ground that the Llanelly Railway and Dock Company had no power under their act to sell any portion of land on which their railway was constructed.

Held, on a mandamus to the South Wales Railway Company to issue their warrant, that, as there was no express claim in any special or general act of Parliament which authorized either the Llanelly Railway and Dock Company to sell any part of their actual line of railway, or the South Wales Railway Company to purchase it, the authority was not to be implied from the general power given to the South Wales Railway Company to make their line and to purchase lands according to their deposited plans and books of reference.

In Erie and Northeast Railroad Company vs. Casey, 2 Penn., 307. Black, J. When a corporation is dissolved by a repeal of its charter, the legislature may appoint or authorize the governor to appoint a person to take charge of its assets for the use of the creditors and stockholders; and this is not confiscation any more than it is confiscation to appoint an administrator to a dead man, or a committee for a lunatic. But money, goods or lands which are or were the private property of a defunct corporation cannot be arbitrarily seized for the use of the state without compensation paid or provided for. This act, however, takes nothing but the road. Is that private property? Certainly not! It is a public highway, solemnly devoted by law to the public use. When the lands were taken to build it on, they were taken for public use, otherwise they could not have been taken at all. It is true the plaintiffs had a right to take tolls from all who travelled or carried freight on it, according to certain rates fixed in the charter, but that was a mere franchise, a privilege derived entirely from the charter, and it was gone when the charter was repealed. The State may grant to a corporation, or to an individual, the franchise of taking tolls on any highway opened, or to be opened, whether it be a railroad or river, canal or bridge, turnpike or common road. When the franchise ceases by its own limitation, by forfeiture, or by repeal, the highway is thrown back on the hands of the State, and it becomes her duty, as the sovereign guardian of the public rights and interests, to take care of it.

and interests, to take care of it. Railroads made by the authority of the Commonwealth upon land taken under her right of eminent domain, and established by her laws as thoroughfares for the commerce that passes through her borders, are her highways. No corporation has any property in them, though corporations may have franchises annexed to and exercisable within them.

Backus et al. vs. Lebanon et al., 11 N. H., 19.

Parker, C. J. The organization has been made, the road has been constructed; and the corporation has been in the full exercise of all its powers. But we look in vain for any stipulation that the property acquired by the corporation under that contract, whether that property be corporeal or incorporeal, shall be exonerated from contributing like other property to the public burdens, or is exempted from any liability to which property is usually subjected in the hands of any citizen of the State. There is nothing in the terms of the grant, nor in the nature of the case to show a contract, express or implied, that the property of the corporation should not be taken for the public use, if it holds any

of such a nature that the public exigency may require it for that purpose.

. It cannot be inferred from the nature of the property. The fact that the corporation does not own the fee of the land over which the road is constructed, does not imply any such stipulation, nor the fact that a part of the property is a franchise.

The fact that the public may now have a use of the road constructed by the turnpike corporation, does not show that the public interest may not require that a public highway be laid over the same ground. The right at present enjoyed, although a public use, is of a limited character, subject to the payment of a toll; and there may be a necessity for an open public highway, which all the citizens may use free of charge. . . And there is nothing in the nature of the corporation, or of the property it holds, to prevent the existence and exercise of this right.

The power to take by eminent domain may be exercised by

county court.

The Trustees of Vernon Society vs. Jesse Hills, 6 Cowen, 25.

(As to whether a defendant can show that a corporation has

forfeited its corporate rights by mis-user or non-user.)

Curia, per Savage, Ch. J. It is settled by the repeated decisions of this Court, that when a corporation sues, they are bound, on the general issue, to prove that they are a corporation.

. . . In Slee vs. Blorm (5 Johns., ch. Rep., 379, 381), Chancellor Kent held that the forfeiture of corporate rights must be judicially ascertained and declared; and that corporate power which may have been abused or abandoned cannot be taken away but by regular process. He considers the cases, and expresses the belief that there is no instance of calling in question the rights of a corporation, as a body, for the purpose of declaring its franchises forfeited and lost, but at the instance and on behalf of the government.

In Perrine vs. Chesapeake and Delaware Canal Co., 9 Howard, 184. Taney, Ch. J. Now it is the well-settled doctrine of this Court, that a corporation created by statute is a mere creature of the law, and can exercise no powers, except those which the law confers upon it, or which are incident to its existence.

. . . The error of this argument consists in regarding the title of the company to the property in question, as denied to them upon common law principles, and measuring their rights by

the rules of the common law.

The corporation has no rights of property except those derived from the provisions of the charter, nor can it exercise any powers over the property it holds, except those with which the charter has clothed it. It holds the property only for the purposes for which it was permitted to acquire it, that is, to effectuate the objects for which the legislature created it.

Vide Head & Emory vs. The Providence Ins. Co., 2 Cranch, 127; Dartmouth Coll. vs. Woodward, 4 Wheat, 636; Bank of U.S. vs. Dandridge, 12 Wheat, 64; Charles River Bridge vs. Warren

Bridge, 11 Pet., 544.

In Ammant vs. The President, Managers and Company of the New Alexandria and Pittsburg Turnpike Railroad, 13 Serg. & R., 210.

Tilghman, C. J. It has been decided that every kind of interest in land, legal or equitable, is subject to an execution in this State. But it does not appear that the turnpike company had any estate of any kind in the land over which this road runs. They were incorporated by the legislature for a special purpose, in which the public were much interested. They were permitted to enter on the land and make a road, under certain regulations, and when the road was finished and approved by the Governor, to take certain tolls. But there is nothing in the incorporating act which authorizes the company to transfer their right to other persons; and such transfer would be certainly inconsistent with the whole design and object of the law.

In Coe vs. The Columbus, Piqua and Indiana Railroad Co., 10

Ohia State R., 375.

The original action in the Court below was brought by Geo. S. Coe, Trustee, against the railroad company and others, praying for a judgment for the sale of the railroad and other property of said company conveyed to said Coe, in trust, to secure the payment of certain bonds and interest-coupons of said company.

Gholson, J. . . . Several of the questions which are presented require an inquiry into the general powers of the company to dispose of its property, and into the liability of that

property to be subjected to the payment of its debts.

A corporation invested with a power to acquire and dispose of property so general and extensive as that contained in the section which has been quoted, can only be limited in regard to the purposes for which the property is acquired or disposed of or from the nature of the property. It is stated in the elementary works that the mere grant to be a body corporate would give, in the absence of any restrictions, the power to acquire and dispose of property (Grant on Corporations, 4). Some restriction, however, is generally found either in the object of the corporation, or in the nature of the property. When such a restriction does not apply, a corporation may very properly be regarded as occupying the position of an individual owner. There would be the same right of voluntary alienation, and a like liability to involuntary alienation. What the company could convey, its creditors might subject. In this view we must construe the provision of the statute that "the real and personal property of corporations shall be liable to execution as other property." - Swan's Stat., 231.

That statute was not intended to authorize the sale of any property which, from its nature, a corporation could not alienate, and which an individual could not take by purchase from a corporation. It does not extend to what are denominated the franchises of the corporation. In the case of a railroad corporation, its franchises and corporate rights are not alienable, without express authority of law. Nor do we think the general language of the first section of the act of 1848, which confers the power to "acquire and convey, at pleasure, all such real and personal estate as may

be necessary and convenient to carry in effect the objects of the incorporation" is to be understood to authorize a railroad corporation to convey all the rights and interests in property which it may acquire. Like many other general words, they must be "restrained unto the fitness of the matter." When power is given to acquire an interest in real estate for the single and exclusive purpose of the exercise of a franchise, and particularly where to acquire such interest there is a delegation of the power of eminent domain, the interest cannot be separated from the use to which alone it can be applied, and if the franchise cannot be conveyed, neither can the interest on real estate with which it is connected. — Redfield on Railroads, 128. But the principle does not necessarily apply to things brought on the land, in which such a limited interest has been acquired. How far these may be alienated by the corporation, or be subjected for its liabilities, will depend upon different considerations.

The corporation having acquired an interest in land for the construction of its road, in that construction affixes to the land certain things, — the timber and iron for the track, the stone and timber for bridges and culverts. It also erects depots, and structures for a supply of water. The road is not regarded as constructed and prepared for use until such things are affixed. But when the road is thus constructed and ready for use, other things are requisite for that use, — locomotives, cars, and other articles and materials, some of which are consumed in the use, and the supply has to be from time to time renewed. Now, we think there is a manifest distinction between the road as constructed for use, and the various things employed in that use; and that the latter cannot, with propriety, be regarded as constituting a part of the real estate, but are the personal property of the corporation.

. . . . But we have no hesitation in coming to the conclusion that what we have described as the personal property of the corporation employed in the use of its road and franchise, is liable for the payment of its debts. We think the line can be clearly drawn between the interest in real estate, and the franchise connected therewith, and the movable things employed in the use

of the franchise.

The distinction appears to us to be as plain as that between a farm and the implements and stock which the proper use of the farm necessarily requires. Also the example of a ferry franchise.

Considerations of public policy and convenience have been passed upon our attention in connection with the question under examination. It may be true that a railroad corporation holds its property, in a certain sense, as a public trust — to answer the purposes of a public highway, the transportation of persons and property. But it is consistent with that public trust to contract obligations. Indeed the very exercise of the trust necessarily involves obligations to individuals, and to meet these obligations, the property of the corporation must in some form be liable. The question is, in what form? Shall it be in the ordinary legal form applicable to the property of individuals, or shall peculiar rules

be introduced, which may have the effect to delay creditors, and operate as a shield to protect property from their just demands?

We have been told that the the sequestration of the tolls of a turnpike company furnishes an analogy which may be properly followed. It is necessary to guard against a very common error, an acting or that which affords an argument by analogy, as if the resemblance in some particulars constituted an identy in all. . .

The order of our inquiry next calls for an examination into the nature and character of the franchises of the corporation. It has been said, "the essence of a corporation consists in a capacity, —first, to have perpetual succession under a special name, and in an artificial form; second, to take and grant property, contract obligations, sue and be sued by its corporate name, as an individual; and third, to receive and enjoy, in common, grants of privileges and immunities." —Thomas vs. Dakin, 22 Wend., 71. Each of these applies to the corporation under consideration. Under the two first is described what may be termed the franchise of the corporators or individual members of the corporation, and under the last, what may be termed the franchises of the corporation; and "a corporation, being itself a franchise, may hold other franchises, as rights and franchises of the corporation." Pierce vs.

Emery, 32 N, H., 484.

By the act incorporating the C. P. and I. Railroad Company, certain persons named as corporators, their associates, successors and assigns, became a body corporate. This was the franchise of the corporators. By the same act, or the general law to which it referred, this body corporate received the franchise of constructing and maintaining a railroad. It may well be, that, for the purpose of a judicial proceeding to declare a dissolution of the corporation, these two franchises may be regarded as indivisible. And in this view it was said, "That the franchise of being a corporation for one general purpose as to erect and make profit from a turnpike, to bank, insure, or the like, comes within the doctrine which denies that a franchise is divisible, would seem to be quite plain." — Cowen, J., in the People vs. B. and R. Turnpike Co., 23 Wend., 223. Indeed, it cannot be regarded as unreasonable to hold, that the capacity to receive and enjoy the franchise of constructing a railroad, and making profit therefrom, being the only object and purpose of the grant of a capacity to be a corporation (?) when the former is lost, it should be adjudged a dissolution of the corporation. But the reason upon which the indivisibility of a franchise proceeds, when a question of forfeiture arises, may not apply in other cases. It has no application, when the question is as to the construction of an authority to dispose of the franchise which belongs to the corporation, as distinguished from that which appertains to the individual members.

If the corporation is authorized to dispose of the franchise to maintain and make profit from a railroad, while a capacity to take from it this franchise, and the right to maintain the railroad and make profit from its use, as such, would necessarily be given to the party to whom it might be disposed of under the authority, it would by no means follow, that the further capacity to be a corpo-

ration would be conferred. The right to take the road, with the franchise of making profit from its use, might be implied from the authority to dispose, but the implication would be extended no further than was necessary. And here it may be observed, that after an act of disposition, which separates the franchise to maintain a railroad and make profit from its use, from the franchise of being a corporation, though a judgment of dissolution may be authorized, yet, until there be such judgment, the rights of the corporators, and of third persons, may require that the corporation be considered as still existing. When that judgment is had,

those rights would be protected.

These views are strengthened by the consideration that, as to the transfer of the one franchise, there is a consistency and propriety arising from its nature and character, that does not apply to the other. This distinction has been clearly pointed out in a recent case, in which it is said, "Among the franchises of the company is that of being a body politic with rights of succession of members and of acquiring, holding and conveying property, and suing and being sued by a certain name. Such an artificial being only the law can create; and when created, it cannot transfer its own existence into another body, nor can it enable natural persons to act in its name, save as its agents, or as members of the corporation, acting in conformity with the modes required or allowed by its charter. The franchise to be a corporation is, therefore, not a subject of sale or transfer, unless the law, by some positive provision, has made it so, and pointed out the modes in which such sale and transfer may be effected. But the franchise to build and own and manage a railroad and to take tolls thereon, are not necessarily corporate rights; they are capable of existing in and being enjoyed by natural persons; and there is nothing in their nature inconsistent with their being assignable."—Hall vs. Sullivan, Railroad Co., 22 Law Rep., 138, Curtis J. Very similar language is used in a recent case in Vermont. Bank of Middlebury vs. Edgerton, 30 Verm., 182.

In this connection it is proper to notice a power delegated to railroad corporations, — that of taking land for the use of the road by judicial proceeding instituted for the purpose. This proceeding is regulated by a general law, and can only be instituted by a corporation, there being no provision for a recourse to it by a private This circumstance has been pressed as one having an important bearing on several of the questions in this case. right to institute such a proceeding can in no proper sense be regarded as a franchise of the corporation. It is rather a means to secure the enjoyment of the franchise granted, a resort to which may become necessary. It usually is necessary to accomplish the object intended, and undoubtedly the faith of the legislature may be regarded as pledged that some proper mode will be provided for the accomplishment of that object. But until the prescribed mode has been adopted and the land obtained, that which is to be done by the legislature or the tribunals acting under its authority can only be regarded as executory. There is no franchise, no grant or contract executed, such as a franchise has been held to be.

When by a resort to the mode authorized by law the interest in the land has been obtained, then the power is executed, and the

enjoyment of the franchise to that extent secured.

There is nothing in the nature of such power which forbids its exercise by an individual when delegated for a purpose of a public nature. Instances of its exercise by individuals, under the law of England and of some of the States, are well known. We need only mention the proceeding by a writ of ad quod damnum, to condemn land for the purpose of a mill. If, then, in any disposition of a railroad, and the franchise of making profit from its use, authorized by law, the ownership and control should pass into the hands of individual owners, and for any purpose of construction or change of location a resort to such a power becomes essential, such individual owners may safely look to the Legislature for an extension of the provisions of the general law. They might justly say that if they were authorized by law to acquire the road and the franchise of operating it for their own benefit and for public use, the legislature would be bound in good faith to afford the usual and necessary means to render the grant made under its authority effectual for the purpose intended. In this respect they would stand, in point of legal right, upon like footing as the original constructors of the road; neither having strictly the right which, as against the action of the legislature, could be enforced,—one relying upon the faith of the legislature that the mode existing would be continued, and the other that a proper mode would be adopted. We certainly cannot hold that such a delegation of the power of eminent domain can be made the subject of grant or of sale. But we do not regard this as any objection to the transfer to individual owners of the franchise of maintaining and operating a railroad, if it otherwise appears to be authorized by the legislature.

From what has been said before it obviously results that, as to the real estate levied upon, the same being part of the railroad, the lien of the legal mortgages would prevail over the claim of the creditor. His right to levy on a part of the railroad or on the real estate held for the use of the franchise of the corporation has not been pressed in argument. We have already intimated that as to an interest in real estate held for the sole and exclusive purpose of the exercise of a franchise, it could not be alienated by the corporation, and of course would not be liable to execution.

In Inhabitants of Worcester vs. The Western Railroad Cor-

poration.

Shaw, C. J. In a petition to this court for a writ a certiorari to the County Commissioners, the inhabitants of Worcester set forth that they are aggrieved by the doings of the commissioners, and pray redress. The petition states that the Western Railroad Corporation have erected and are the owners of several valuable buildings situated in the town of Worcester, to wit: a house for a passenger depot, a freight-house, a car-house and an engine-house, and that said buildings stand partly within and partly without the line of the railroad location; that in the year 1841 the corporation, being owners and occupants of the said buildings, the same were

taxed by the assessors of Worcester their due proportion, with other real estate, to the town and county taxes. Upon an appeal to the County Commissioners they abated all that part of said tax which was assessed upon buildings lying within the limits of the location of the road, and that they confirmed the tax upon the buildings or such part of the buildings as lav without the limits of such location. The complaint of the inhabitants of Worcester is that no abatement ought to have been made; that they had a right to tax said corporation for real estate, such as depots for passengers or merchandise and buildings used for car and engine houses, although they lie in whole or in part within the limits of the location of the railroad, and although used for purposes incident to the business of the corporation as carriers of passengers and car-Their claim is that although the mere franchise or right of way along the strip of land appropriated to the track of the railroad may be exempted from taxation, yet that the real estate, consisting of buildings and other structures connected with

it, is not entitled to the same exemption.

This is a question of great importance in its bearing upon the rights and interests of this class of corporations. To determine it properly, it becomes necessary to consider the nature and purposes of these corporations, the franchises granted to them, the duties required of them, and the objects they were intended to accomplish. These are to be sought in the particular act of incorporation, and in the general provisions of law applicable to them. By the act of incorporation the persons named, etc., are made a corporation to lay out and construct the railroad described; authorized to lay out their road five rods wide, through the whole length, and for the purpose of cuttings and embankments, and procuring stone and gravel, to take as much more land as might be necessary for the proper construction and security of said road; with a proviso stipulating for the payment of damages for private property thus taken. By section 3, the president and directors are authorized to provide for the transportation of persons, goods and merchandise, etc.; to purchase and hold land, materials, engines, cars and other necessary things for the use of said road and for the transportation of persons, goods and merchandise. . . . this view of the various provisions of the law by which the rights and duties of the Western Railroad Corporation are regulated, it is manifest that the establishment of that great thoroughfare is regarded as a public work, established by public authority, intended for the public use and benefit, the use of which is secured to the whole community, and constitutes, therefore, like a canal, turnpike or highway, a public easement. The only principle on which the legislature could have authorized the taking of private property for its construction, without the owner's consent, is, that it was for a public use. Such has been held to be the character of a turnpike corporation, although there the capital is advanced by the shareholders and the income goes to their benefit. Commonwealth vs. Wilkinson, 16 Pick., 175. It is true that the real and personal property necessary to the establishment and management of the railroad is vested in the corporation; but it is in trust for the

public. The company have not the general power of disposal incident to the absolute right of property; they are obliged to use it in a particular manner and for the accomplishment of a well-defined object.

Treating the railroad, then, as a public easement, the works erected by the corporation as public works intended for public use, we consider it well established that, to some extent at least, the works necessarily incident to such public easement are public works, and as such exempted from taxation. Such, we believe, has been the uniform practice in regard to bridges, turnpikes and highways, and their incidents.

nighways, and their incidents.

The general principle is not denied in the present case, but the question is, as to the extent, etc. . . . The transportation of persons, goods and merchandise, is the object to be accomplished; and for this purpose they may hold lands, materials, engines, cars and other things. Articles so held are appropriated to public use as incident and necessary to the object to be accomplished.

CLOSING ARGUMENT OF HON. J. G. ABBOTT FOR THE PETITIONERS.

May it please your Honors, — A variety of objections have been made against the right of the two parties that I represent here — Mr. Faulkner and the Talbots — to recover in this case, objections growing out of the title which they have put in before your Honors, - growing out of the fact that both these parties claim originally under the proprietors of the Middlesex Canal. I believe almost all these questions have been argued before you, with possibly the exception of one of them, and I shall not take up so much of your time and attention with reference to them as I should have done if they had not been gone into fully previous to this point of time. One matter, however, I want to suggest to you at the commencement. Independent of any title from the Middlesex Canal, we show possession of this property and, Mr. Chairman, I propose rather to indicate the arguments here than to follow them out and enlarge upon them — we show possession of this property since 1851 on the part of Mr. Talbot, since 1857 under deed from Mr. Talbot, and long previous to that deed by Mr. Faulkner and those under whom Mr. Faulkner claims, not the Middlesex Canal.

Now I claim — and I desire you, Mr. Chairman, as the legal part of the commission, to pass upon it — I claim, as a matter of law, that that possession is a perfect title as against

the City of Boston, or as against anybody who does not come in here and claim under a better title than that possession on the part of my clients. And I claim, as the law in this case, that nothing more was necessary for me to prove. I could have stopped there, and there has nothing been put in upon the other side that would call upon me in any way to meet it, no more than to show a possession, a claim of ownership, such possession as amounts to claim of ownership on the part of the Talbots and Faulkners in these two cases, and there leave them, so far as right to recover was concerned, because the City of Boston have failed to show any connection with anybody claiming a superior title to that title by possession. And I think that would be a sufficient answer to start with, and all I desire is that you should con-

sider it in passing upon this case.

But I am entirely ready to meet the suggestions made by my friend on the other side in reference to the title that we do claim under. It seems, and it has been proved to you, that in seventeen hundred and ninety odd the original charter was granted to the proprietors of the Middlesex Canal in the form then used, because I find this almost exactly in the form of that granted to the proprietors of locks and Canals on the Merrimack river, and the same phraseology used with reference to the right to convey real estate. The right in that charter is given to the Middlesex Canal to hold for themselves and successors forever certain real estate deeded under that act. By subsequent act they are authorized to buy and hold thirty thousand pounds more in real estate; and by a still subsequent act, in order to make certain what their rights are, it is enacted that the proprietors of 'the canal, in their corporate capacity, shall be empowered to purchase any mill-seats on waters connected with the canal, or any lands to accommodate the same, and thereon to erect mills. That is after having a right to hold lands up to five thousand pounds, and then by a subsequent act to hold them up to thirty thousand pounds, an explanatory act is passed and a new grant made, giving them authority to purchase and hold any mill-seats on waters connected with the canal and lands to accommodate the same, and thereon to erect mills. Now, under this act the Middlesex Canal purchased of Thomas Richardson, who claimed under the grant from the town of Billerica a certain mill privilege, with the lands upon which the mills are situated. By looking at that deed, sir, you will find that it covers forty acres of land on the west side of the stream that is, where Mr. Talbot's mills now are — and a small tract on the east side where the head of the dam on the east

side abuts upon the shore at that place. So that you find the Middlesex Canal purchasing under this provision, that they may purchase mill-sites on any stream.

Mr. Butler. On any, brother?

Mr. Abbott. They purchased it, and then the act came in afterwards and ratified that purchase. They have the right to purchase and to hold lands and mill-sites on streams connected with the canal, and to erect thereon and run mills; so that you have this provision,—in addition to the rights to build and make a canal for the purposes of navigation, - you have the right given to them to purchase and hold mill-sites and land necessary for the purpose of building mills on streams connected with the canal. Under that act, and by virtue of that act undoubtedly (for it was passed for the purpose of defining their rights), they held the conveyance of land, which was made to them by Thomas Richardson, of this mill-site which was created by the town of Billerica, 1708, three-quarters of a century previous to that point of time, they held this property until 1851, using it, as it appears here, for the purposes of a mill-site and running mills, having sold to the Faulkners and to Mears certain rights, always subordinate to the right of using the water, or the necessity of using the water, for the purposes of navigation. They held this property, I say, under this deed, until 1851, when they sell the property to Mr. Talbot and his brother, who appear here and are petitioners, subject, in the first place, to the reservation of all rights that may be necessary for the purpose of keeping up the canal as long as the canal is in use, and then upon a further condition that the grantees in that deed shall not draw the water below a certain point, after notice given them, until the canal is discontinued. In fact, as it appears, at that time, at the time that the deed was made the canal had been discontinued, —I say in fact, in contradistinction from legal discontinuance. It had been partially filled up, so that it was no longer in use, and the proprietors undertook to sell certain lands and certain millsites which they had acquired, as I have called your attention to before, under this third addition to their act of incorporation and their right to hold mills, — sold them to Mr. Talbot, subject to the right, as against him, of using all the water that might be necessary for carrying out and exercising the franchise of keeping up a canal for purposes of navigation, so that it does not raise the question here of their attempting to sell any part of the franchise of the corporation, that is, any part of that land or that property which was clothed with the franchise of the corporation, so that they should be no longer able to carry out and discharge the duties that were obligatory upon them as holders of that public franchise.

Mr. Butler. They sold the canal, didn't they?

Mr. Abbott. They sold certain lands, certain waterrights, certain mill-privileges, subject at all times to the reservation and the condition that they should reserve all the water, and the right to use all parts of the land necessary for the purpose of carrying out this public purpose and public object, to wit: undertaking to run that canal. not undertake to sell, — as against their obligations and in the face of their obligations — they did not undertake to sell the land or the water-rights, so that they should no longer be able to discharge their obligations to the public. On the contrary, they only sold what they had, subject to this obligation which was imposed on them by the franchise. They did not undertake to sell anything else. They sold that which was not necessary, and could not be necessary by their express reservation, for the purpose of discharging their duties to the public under this franchise which had been granted to them, — not the selling out of the franchise of the corporation or the property of the corporation, — so that it would be impossible to discharge the duties imposed upon them by that franchise, because that would raise a different question; but selling it out, Mr. Chairman, subject to the condition that at all times the right under this grant to build, run, and operate a canal should remain: I say this grant was made subject to that right; and that right was above and beyond the right of the Talbots, so long as that right should exist, and no longer.

Upon this very point, of whether they had the right to sell that which they did sell (not to undertake to sell their franchise, or any part of it, or any part of their property which prevented them from acting under and discharging all the duties and obligations imposed upon them by that franchise) — upon this point, in this very case of Heard vs. Talbot, I would like to have you, your Honors, look at the reference which I shall make. Look at it for a moment. This deed was before the Supreme Court at that time. charter was not forfeited in any way whatever. There was no claim at that time, that the charter was not in full force. Why, if the position taken by the city was a right one, the first answer would have been, "What are you keeping up this nuisance against me for? So far as you are concerned, you are undertaking to keep up the dam, and you have no rights, because the Middlesex Canal could convey you noth-They had nothing to convey, and could convey you nothing." On the contrary, this deed has been sanctioned

by this decision of the Supreme Court, because they say that the Talbots, claiming under a deed from the Middlesex Canal, have a right to set up the franchise and rights of that Canal; that the deed is not void, but "having been made by the Middlesex Canal, the grantees have a right to go farther and set up the franchise which they did not purchase, and avail themselves of it so long as that franchise exists." How could you have a better judicial determination of the validity of this deed so far as the Talbots were concerned, than that very decision? because the Court not only say that the deed passes what it claims to pass, but, further than that, the grantees can set up that very franchise granted to the Middlesex Canal.

Now I understand that it is claimed here that by the phraseology used in that act there is a right given to hold real estate, and no right to convey real estate. I mean, independent of the construction I have been calling your attention to, that this deed does not convey or interfere with the public franchise granted to the Middlesex Canal; that by the phraseology of the act, it is one to hold and not to convey. All I have to say is, that if you take up one of the volumes of Special Laws, where you have a great many corporations, you will find that always the grant is, in creating a corporation, of a right to hold real estate of such and such value, for the purposes of the corporation; and I don't believe you will find in any of them any power to sell. It is merely a right to hold. And who ever heard before, unless there was a restriction or something imposed directly upon the right to hold, — who ever heard before that the right to hold the absolute and full title would not carry with it the right to sell that full title? And, sir, if that phraseology does not convey that right to four-fifths of all the corporations created in Massachusetts, why, then, with the right to hold they have not the slightest right whatever to sell. It is like the case of conveyanance to a natural person. We have the Richardsons' deed, which is all-important in carrying the water and water-rights. The mill-site runs to us and our "successors forever," precisely as a deed conveying a fee would have been to you and your "heirs," without putting in "assigns." It is a conveyance of the fee; and unless there are some restrictive words which apply to the case and do not apply generally, why, merely because it fails to put in "assigns," merely because the provision is made that your "heirs" may hold, it does not prevent you from selling the land. Precisely, in an analogous case, this deed to parties "and their successors," or grant of privilege to hold "to them and their successors forever," is exactly the same as a deed to you of land,—to yourself and your "heirs forever." That would be giving you the right to sell, beyond all peradventure, unless there was some condition or restriction imposed upon

the grant or the right to purchase real estate.

But, then, Mr. Chairman, there is another answer to all this matter, it seems to me, and a perfect one, in reference to this right to sell. It does not lie in the mouth of the City of Boston, if the Middlesex Canal had no right to sell, if they, as against their stockholders or as against the original owners of the land (I mean the persons who conveyed to them who were the original owners), had no right to sell, it does not lie in the mouth of the City of Boston to set up that claim. That is a claim which, when it comes up, can be dealt with. Between persons claiming (if there are any such persons) and ourselves, it is sufficient (and I do not mean to trouble your Honors longer on this point) — it is sufficient that the title to that estate was in the corporation. corporation have undertaken to convey that title to us. Now, if the stockholders of that corporation may have any rights in that estate, or if the persons conveying to that corporation may have any rights in that estate, they are not rights that can be availed of by the City of Boston. It is sufficient that we take title directly from the corporation, they having a right to convey, and we can hold that as against the City of Boston, so far as this part of the case is concerned, notwithstanding there may be outstanding rights on behalf of other parties.

Then I understand that the more important objection made by my friend on the other side, and which he has elaborated at greater length than the other questions, is the fact that the charter of the Middlesex Canal has been forfeited and declared forfeit for a non-user. Well, sir, about the facts in reference to that part of the case there is no question whatever. Long after the deed made to the Talbots — ten years after — a resolution was passed by the legislature in 1859, directing the Attorney-General to prosecute a quo warrauto against the Middlesex Canal, requiring them to appear before the Justices of the Supreme Court and say why the charter of the corporation should not be adjudged to be forfeit. Under that resolution proceedings were had, at the April Term of the Supreme Court, in which this judgment is given, that it is considered by the Court that the proprietors of the Middlesex Canal, or any persons pretending to hold the liberties, privileges, and franchises of said corporation do not in any manner enjoy those liberties under and by virtue of any authority conveyed by the act of incorporation, and that the said proprietors of the Middlesex Canal be absolutely

forejudged and excluded from having, holding, using, exercising, or enjoying said franchises, privileges and liberties, and that the Commonwealth recover costs, etc. That is followed, in a subsequent act in 1860, which is the common way of declaring the charter of a corporation forfeit.

Now, I want your Honors' attention to one thing to start There is no attempt (and if the attempt had been made it necessarily must have been unsuccessful) to affect the rights of any human being except the proprietors of the Middlesex Canal. Nobody else is a party to that proceeding. Nobody else's rights could be affected in any way by that proceeding. And your Honors will notice that neither the legislature affect them, nor could the court undertake to, in their judgment of forfeiture, nor the legislature when they accept that forfeiture. They undertake to affect in no way the rights of third parties, for the very obvious reason that third parties were not parties to that judgment in any way whatever and their rights could not be affected by it in any way whatever. Now what is the effect of that judgment? My friend claims that the effect of that judgment (and here is the reason for the elaboration of the argument on the other side growing out of this title, and for the stress put upon the case), is this: That there was a grant of certain privileges, liberties and franchises to the proprietors of the Middlesex Canal; that by non-user (for there is no allegation farther than that) - by non-user on the part of that corporation, those privileges, liberties and franchises became liable to forfeiture, and that they were declared forfeited and resumed by the Commonwealth, and therefore that the Commonwealth not only gets the liberties, franchises and privileges granted by the Commonwealth to the corporation, but they get, in addition to that, all the property that the corporation acquired under their charter. Now, I undertake to say, may it please your Honors, that you cannot find anywhere any such result from a judgment of forfeiture by a court having the authority to declare the charter forfeited. The words of the legislature accepting this declaration and this judgment of forfeiture on the part of the court are somewhat significant.

Mr. Butler. Pardon me; you did not read the whole. "It is considered by the court here that the proprietors of the Middlesex Canal, or any persons pretending to hold the franchises and privileges of the said corporation, do not in

any manner hold," etc.

It is not only the Middlesex Canal, but any persons pretending to hold their franchises. Mr. Abbott. I read all this; and it is now only made necessary that I read it again.

[Reads it again.]

It is the liberty to run a canal, — there is not anything

said about mill privileges.

And now follows the judgment. "It is adjudged that the proprietors of the Middlesex Canal"—nobody else—"be absolutely forejudged from holding and using any such franchises and privileges."

Then the act following in 1860 upon this judgment of the Supreme Court, after setting forth in the preamble this judgment of the Supreme Court, says, "It is enacted as follows:—

"All the privileges, liberties and franchises granted or given by the 21st chapter of the acts of the legislature of the year one thousand seven hundred and ninety-three, incorporating said proprietors, or by any subsequent acts in addition thereto, are hereby declared seized into the hands of the Commonwealth, forfeited and annulled in consequence of the non-feasance and mis-feasance of said corporation, and the neglect of their corporate duties, in accordance with said

judgment and decree."

Taking the first resolution, the judgment of the Supreme Court and the act following upon the judgment of the Supreme Court accepting the forfeiture of the charter, it simply puts the forfeit in the neighborhood of Billerica, in reference to the Middlesex Canal, precisely as if the grant had not been made. It is simply annulled for the future. They put an end to it for the future. It does not undertake to interfere, Mr. Chairman, with any grants made by that corporation before the legislature undertook to come in and accept this judgment of forfeiture made by the Supreme Court. Why, there is a case in New York which I will hand to your Honors, where there was a conveyance made by a corporation after service upon them by notice of quo warranto, which was prosecuted to forfeiture, and still the grant was holden perfectly good, —the deed made after service of the quo warranto upon them, — under which their charter was subsequently forfeited, and the deed was holden good on the ground that the forfeiture accepted by the legislature is of their corporate rights only.

Now the claim I make, Mr. Chairman, is this, —I address you, Mr. Chairman, because this is rather a matter of law than a matter having to do with the other parts of the case, —the effect of this judgment of forfeiture is this: it does not pass into the hands of the Commonwealth the property of that corporation. The judgment of forfeiture by no means ever passes into the hands of the Commonwealth any

property of the corporation, even if it should attempt to do it. What, then, does it do? It annuls the grants made by the legislature to that corporation. What are those grants? The first grant is the franchise to be a corporation. next grant is, in this particular case, the franchise of holding lands, and raising a head of water for the purpose of making a canal, and running and using that canal for the purposes of navigation. It is not a grant of any property. It is not a grant of any water or water-right. It is simply a grant of a franchise by which it may go and take from others the property of others upon the payment of damages to them, and use that property for certain public purposes, to wit, in this case maintaining a canal, - which they could not do except for this franchise. Now, Mr. Chairman, — pardon me for going a little more at large into this than I ordinarily should have done, because it has been enlarged upon mostly through the morning by my friend on the other side, — the grant by the legislature to the corporation is of these two franchises, not a grant of property. They do not grant to the Middlesex Canal, and never have granted to the Middlesex Canal, any property or any right of property. They granted to them the franchise of being a corporation, and the franchise exercising a right of building, maintaining, running, and operating a canal, and holding lands to a certain extent for the purpose of running mills. The franchise permitted them to take property if they could not buy it, take it, and pay for it in the way pointed out in the statute.

Now when the court in the first place come in and adjudge the charter forfeit, and then annul "all" the privileges, rights, and franchises, and declare forfeited all the privileges, rights, and franchises granted to that corporation by their charter, or in acts in addition to it, and when the legislature come in and declare the franchises, privileges, and rights of the corporation seized to themselves and annulled, why what does it mean? Why simply that they have taken back as forfeited to the Commonwealth, and annulled by the Commonwealth, the privileges, rights, and franchises which had been granted to these proprietors, and nothing else; the right to be a corporation ceased from that time, the right to operate a canal for the purposes of navigation, and the right to hold certain lands for mill purposes. But that judgment did not undertake to deal with - and if it had undertaken to deal with it it could not have dealt with it legally - it did not undertake to deal with the property that had been acquired under these franchises by the exercise of those franchises. That property was to be dealt with in other ways. If there were creditors, it would belong to the cred-

It might, under certain circumstances, revert. the property had been sold to others, it would belong to the persons to whom it had been sold. So that when my friend undertakes to claim here, on account of this forfeiture, that the Commonwealth have once taken this land for public purposes, or permitted the taking of it for public purposes by the proprietors of the Middlesex Canal, and have then come in and seized the franchises granted to them, — seized this right to raise a head of water on the Concord river, — or that they hold that and can grant it to anybody else they please, he entirely fails, for the reason that the Commonwealth have undertaken to seize no water privileges, no rights to keep up a head of water, no property whatever. They have only said to these proprietors, "We seize and take back from you the franchise of being a corporation and the franchise of running a canal. We do not undertake to take from you the property you have acquired under this franchise."

Why, sir, they have paid nothing for it. If you will examine carefully the Chase & Sutton Manufacturing case, as I have no doubt you will, and as I have no doubt you have, you will find that it is no authority whatever to give the Commonwealth, after the forfeiture of a charter by a canal company, the right to grant the property acquired under that franchise to somebody else without his paying for it. case only goes to this extent. When the Blackstone Canal for one public purpose under their franchise had acquired property and paid for it, that corporation might be permitted to use it or sell it for another public purpose without paying anew for it to the persons whom they had paid for it once. But it does not pretend or claim in any shape whatever the right on the part of the Commonwealth to make this grant to a third party to take and use this property because the Blackstone Canal had once taken and paid for it for the purposes of navigation. The case does not touch this particular matter that we are dealing with at this time. It does not reach or touch it in any way whatever. I claim, therefore, Mr. Chairman, that so far as the right claimed here on behalf of the City of Boston, that they can take the waters of the Sudbury river from Mr. Talbot, who claims them under a deed from the Middlesex Canal, because the charter of the proprietors of the Middlesex Canal was declared forfeit and was a right of property of the Middlesex Canal taken back to the Commonwealth, and they could grant it anew, fails, and fails because, in the first place, the Commonwealth had no right to do that, and in the next place they didn't undertake to do it. There is no consideration. There is nothing paid by the Commonwealth to the original owners of that property for the property taken and appropriated by the proprietors of the Middlesex Canal. There is no consideration paid for it, and nothing ever came into the hands of the Commonwealth; only they simply did this: they simply took back the grant that they had made, to wit, the franchise and rights to do certain things and exercise certain privileges.

Mr. Butler. And one was the right to keep up the

dam.

Mr. Abbott. I find, upon looking at the answer (I don't propose to enlarge farther upon this part of the case, except that when I come to look at these authorities which are to be printed, I will furnish an answer), there is one other objection made to our right to recover, and that is, that we have not attempted to agree and failed to agree. The answer to that was made in the Essex Company's case, and made by the citation of an authority where, in substantially a case like this, the court have decided that the bringing of an action was sufficient evidence that they could not agree, and that it was not necessary to put in evidence, beyond the bringing of the petition, that the parties could not agree. I don't propose to trouble you upon that subject farther, because it seems to me that, aside from this authority, upon the reason of the thing, the bringing of the petition by one party is the strongest possible evidence that can be furnished, —it taking two parties to agree. It says that the parties cannot and have not agreed upon the subject in reference to which the petition is brought. As I understand it, that is a matter which has been directly adjudicated upon. I do not propose to trouble you further upon it than to say this: That, while the answer in this case is full of all manner of points, I think there is not in any part of the answer that objection, "that the parties have failed to agree."

Mr. Butler. I guess you are mistaken. I will bet a thousand dollars it is there. It has dropped out if it is

not.

Mr. Abbott. My brother gives me a citation of the case Bird vs. Brigham and Bird vs. Goddard. I think those cases were cited to you by Mr. Merwin, and the statute was given under which they were decided, which seems to be identical with this: "If the agent or agents employed by the United States, and the persons owning or interested in such estate, cannot agree upon the damages to be paid therefor." In our statute it is almost precisely the same, so I will not pursue this matter further.

There is another objection made in the answer, that we,

that is, these two parties, the Talbots and the Faulkners, had not joined in one petition. That has not been argued to you by my friend upon the other side, and if he does not intend to insist upon it I should be glad to know it.

Mr. Butler. I do. I have argued it once before, and I don't think it is necessary to insist upon it again. I argued it in the Essex Company's case, and when this case began it

was opened expressly.

Mr. Abbott. I understood that he claimed it, but, as it was not argued, I understood that it was abandoned. I shall not detain you long upon that subject. The claim is here that the Talbots and Faulkners do not join in one petition against the City of Boston, because it is claimed that between them they own the right to the use of the water in Concord river, and that the City of Boston should pay one sum in the gross for the diversion of the water from that particular place where these parties have the right to use it. I have no doubt that it would be true if Mr. Talbot and his brother and the Messrs. Faulkner were joint owners in common of land and water rights, if they were tenants in common or joint owners of that water-right, it might be true that they must necessarily commence their petition together and all join in it, because they would then be the owners of the property that was alleged to be injured. One would not be the owner severally, but each jointly would be the owner of the whole. Of course, they must join in such a case as But that is not this case. They own land separately and independent of each other. Mr. Faulkner owns the distinct, separate and independent right, disconnected from Mr. Talbot entirely, of using $57\frac{3}{10}$ cubic feet of water under certain circumstances, drawing it from the river and using it under certain circumstances. Mr. Talbot claims and owns the right to use all the rest of the water to any extent, as much as he desires, until the water gets down to a certain point, and then he has the right to use a certain specified amount of water, which is measured by the size of certain gates which have been before you. Well now, these two rights, although they are carved out of the water-power which exists at this point in Billerica mills, are entirely separate and distinct, the one from the other. There is no joint ownership which would entitle the city to claim that the petitioners must join. They are distinct and separate. The damages may be very large in one case, and very slight in the other, depending upon the circumstances of the property owned by the two parties, and to which these different rights are attached. But this matter has been settled, as I think, substantially by authorities, and authorities familiar to you,

Mr. Chairman, undoubtedly. Under the original highway act, going back, I think, previous to the present century, there was a provision that the owners of land and the owners of buildings taken for a highway should be entitled to their remedy before the old Court of Sessions. The words used are "owners of land or owners of buildings." Well, the question came up in the very first volumes of Massachusetts Reports — I think in the sixth volume; I cannot give you the page, but it is the case of somebody against Welsh, I think. I will give it to you hereafter. Welsh was the lessee of certain lands and certain buildings which had been taken for laying out a street, and the question came up whether he was entitled to maintain the process provided by the statute for the purpose of getting his damages, and the court held in that case this substantially: That the term "owner of the land" or "owner of the buildings" was large enough to cover the case of every person who claimed an interest in the land or in the buildings; and that the owner of the land and the men who owned the remainder, after the carving out of a life estate, or an estate for years, were both

entitled to remedy against the city for the taking.

Then, farther, in the case of Parks against Boston, which is in the 15th of Pickering, the words of the statute had become altered by that time, and instead of the owners of the land being alone entitled to a remedy, all persons were entitled to it who should be damaged in their property. It is almost word for word the expression used here in this act. I think it is to the effect that all persons damaged in their property are entitled to certain proceedings, -going before the County Commissioners, and so on, and getting a jury. Parks was the owner, I think, of the property. Paterson had a lease for three or four years, and each one commenced separate proceedings before the court, and the question came up, whether under the act providing that all persons damaged in their property, as in this case, were entitled to remedy, whether they were entitled to separate proceedings, or whether they should join; and the court held that each party, the lessee as well as the lessor, was entitled to separate proceedings; and that decision, I fancy, was the occasion of the act being passed upon which my friend seems to have formed this objection mainly, — the act being passed in reference to highways, and also in reference to railways, that you must join all parties having any interest in the land, either estate for life or estate for years, or any estate less than the absolute fee. They may all be compelled to join, and the verdict of the jury shall be for one gross sum, which is to be divided afterwards between the parties, and then the provision was

made that the holder of any other estate than a lease for years or for life should join in the remedy, which makes it a little troublesome at times. But these provisions have not been adopted in this statute, by which the city are entitled to take land and water. Therefore, under this statute, under which the city are entitled to take water-rights and land, under this as under the old highway acts, every person who has been damaged in his property, although it is a smaller estate carved out of a larger one, must necessarily be entitled to his several petition, and he cannot join, as there is no provision made in the statute for him to do so.

I believe now I have gone over the objections made by my friend on the other side, all of them, as far as I recollect; not at length, and perhaps not quite so much at length as it would be well for me to do, but perhaps at sufficient length for the purposes of this trial. I believe I have alluded to every one of the objections, so far as the matters of law are concerned, with the exception of one which is applicable to the damages; and while I am upon matters of law, perhaps I had better take it up here and consider it, although it is a matter which has reference entirely to the quantum of damages; and that is the claim made by my friend here, that you are to give damages for the diversion of the natural flow of the stream and for nothing else, i. e., you are to travel back somewhat.

If you are to take the natural flow of the stream, you are by no means to go back for half a century or a century, because then the stream had been affected more or less by artificial means. You are to travel back to the settlement of the country and ascertain if you can exactly what the natural condition of the stream was, and then you are to give us, not, sir, what we have suffered by any means, which is the diversion of water as it was in 1872, but you are to give us damages which we should have suffered provided the water had been in 1872 as it had been two hundred and odd years ago when it was in a state of nature. You are really to forget the fact that we have had some kind of civilization here for the last two hundred years. You are to refuse to ascertain and say what the damages were in 1872, when the act was done for which we are seeking damages from the defendant. You are to go back and say what they would have been provided that had not happened which has happened—provided we had not been settled here for two hundred years, living upon the banks of the river and more or less affecting the flow of water in the river. Why, the proposition is preposterous. You cannot do it to start with, as the Chairman or some one of your Honors had

occasion to say at one time — and there was no occasion that you should do it. But you should be asked to give damages for that which we had suffered, and not damages for that which we might have suffered provided that had not happened which has taken place. Indeed, gentlemen, it is forgetting the fact that the value of all property depends upon the use of other property by other people in the neighborhood, and that you have no legal right in reference to any property that you own in the world to say that your neighbor should use his property in a certain way, or live upon it. You have no legal right to compel him to do it; and still the value of your property to a very large extent, if it is taken from you, depends upon the fact that your neighbor does use his property in a certain way, and that he will in all reasonable probability confinue to use it in a certain way. I believe the illustration was made by my friend who argued the first case, Mr. Merwin, that the value of every foot of land in Boston depends absolutely or almost absolutely upon the fact that other people shall do certain things which the owner of the land has not a particle of right to compel them to do; and you might with just as much propriety say, when the City of Boston should take the most valuable piece of land on State street for widening the street, you should go back to its condition when in a state of nature, and ascertain what the value of that land was when Blackstone first came here to the city of Boston, because you could not compel the inhabitants to live here, as to say that you shall not give us the damages for that which was taken from us; although we have no right, I grant, to compel the people who have built dams on the stream above us to keep them up.

But, aside from the reason of the matter, I think there are authorities which bear so substantially upon it that they settle the question. And the first is really a decision (half decision and half dictum) of Chief Justice Shaw, from the 4th of Gray, Tourtelot and Phelps; and a dictum from this jurist is equal to a decision from a great many courts. I will only read that portion which I specially refer to. It

is upon pages 374 and 375.

Here you have the principle enunciated by the authorita-

tive declaration of the late Chief Justice.

In addition to that I desire to refer, as bearing upon the same matter and upon some of these other matters which I have been discussing, to the case of White vs. The South Shore Railroad, in the 5th of Cushing, 412. That was this case: the legislature had granted to White the right to build a dam upon a navigable stream where the tide ebbed and flowed, with the reservation and condition attached to

it, that a certain sluice-way for the passage of vessels, and another sluice-way for the passage of herring, should always be kept open. The South Shore Railway located their railway over the pond created by the dam which was thus granted under the act of the legislature. It turned out from the very beginning that the dam had been built without the slightest right, as against the public or the Commonwealth. They had never complied with the provisions of the statute. They had built no sluice-way and no place for the passage of herring; and the claim was, when the South Shore Railway, under another grant from the Commonwealth under the right of eminent domain, for public purposes, came in and located their road over this pond, - the claim was, "You have lessened our water-rights by filling up part of the pond." It was answered: "You cannot complain. You do not own anything there. You have no right there whatever. You have no right to keep your dam there whatever. You have no right to keep that dam up. It is a nuisance." It was true that it was a nuisance. In that case the sheriff ruled against the objection; a verdict was rendered; the case came up before Judge Hoar, who was then on the Common Pleas bench. He held that it was a good objection, and set aside the verdict. The Supreme Court accepted the verdict. They said that the South Shore Railroad must pay damages, and the fact that the Commonwealth could interfere, or perhaps anybody else could get them indicted for a nuisance, was none of the business of the South Shore Railway; so I say with reference to the City of Boston, "Whatever dealings we may have had under this act in reference to the Middlesex Canal, is none of your business. We will deal with you in reference to your rights here."

Again, there is another case bearing upon this point. It is that of Tufts vs. Charlestown, in the 4th of Gray, 537. That case was this: A street was laid out by the City of Charlestown over land over which there was a right of way in a third party. The petitioner owned the land subject to this right of way. He had built upon that land a house. He had no right to keep it there, as against the owner of the right of way, and that was attempted to be availed of by the City of Charleston in reference to a question of damages,—as they say to us here, "You have no right that the Saxonville dam, and these other dams, should be kept up. You cannot compel the owners of these dams to keep them up for a day." So the the City of Charlestown said in that case, "You cannot keep your house there for a day. Somebody else can compel you to take it away at any moment of time.

Therefore you have no right to claim damages for that. You have a right to claim damages for what you have a legal right to, and nothing else." The court below ruled the other way, and it was sustained by the Supreme Court, — that the party had a right to obtain damages from the City of Charlestown for the moving of the house.

Then I have the case of Parker vs. The Boston and Maine Railroad, in the 3d of Cushing, 114. One of the claims in

that case was for draining a well.

Commissioner Russell. [Interrupting.] Here is a case to which I would call the attention of both counsel,— Marsden

vs. The City of Cambridge.

Mr. Abbott. [After reading the head-note.] I should say from this head-note that he had no legal right to have that part stay there. Still, the court says, that, as against the city the plaintiff may recover damages for removing that which he has no legal right to have kept where it was, when removed.

Commissioner Russell. It would seem to carry the

doctrine a good way.

Mr. Abbott. I don't think it would carry it any farther than the case which I have just cited from the 3d of Cushing. That case was this: The petitioner claimed damages for draining a well upon his own land, by the act of the defendants in locating their railway and digging a deep cut on somebody else's land that they had taken, — not his land. But in making this cut they had interfered with these underground springs which filled his well on his own land; and his claim against them was for damages for destroying this The answer on the part of the railroad was this: It is perfectly well settled that you have no right to have water run under another man's land into your wells. It is well settled, that if I have a well on my land, you on yours may dig a deeper well and drain my well, and there is no legal claim for damages for that act. The owner of the well drained has no right to have the water-springs feeding his well run through his neighbor's land. They may be cut off at any time, so far as his well is concerned. Now come the railway company and locate their railway upon the neighbor's land and dig their trench, and it cuts off the underground springs from the petitioner, which fed his well upon his own land.

Mr. Butler. [Interrupting]. Oh, no, they opened on the other side and drained his well. That was the trouble. I

cited a case the other day, from the 6th of Cushing.

Mr. Abbott. They cut down upon somebody else's land. Now the claim was true, as between individuals, beyond all

question, — "You have no easement in the flowing of water through your neighbor's land to your own land or well. Therefore, when that is interfered with, to which you have no legal right, it is not a cause for damages. You cannot maintain any action for damages for that reason." Still, in that case, the Chief Justice gives the opinion of the court and holds that railways, or anybody coming in and claiming under a grant from the public by right of eminent domain, upon condition that they shall pay damages to any person injured in his property, must pay for the well. think the principle of that case would sustain this case which you have just cited, which I agree goes a little farther. seems to me the principle of it would sustain that case. The railway did not take any of the petitioner's land when they drained the well. The taking of land was of a neighbor's land; and if the neighbor had done those very acts he would have had a perfect right to do them. And when this railway company come in claiming, under a grant of the legislature, upon condition that they shall pay all damages, they are to pay damages, when as private individuals and owners of the land, they would not be compelled to pay. The question is one of damages, and of damages alone. I believe that is

all I desire to say upon that subject.

I have gone over these matters as briefly as I possibly could, and perhaps too briefly, but I think not; because for you who are to pass upon this question of law it is sufficient to indicate the answers to the positions taken by my friend on the other side. I think I have established this right, — the right on the part of the two clients that I represent here, the Talbots and Faulkners, to be paid their damages for the taking of the water of Sudbury river, such as they have been proved to be, and all that they are fairly and reasonably entitled to for the deprivation of the amount of water taken. The cases of course depend very much, almost entirely, upon the same evidence; and the rights are such that it so happens that Mr. Faulkner must be damaged, and damaged in the first place before Mr. Talbot is reached; i. e., the moment the water gets down to a certain point, the right of Mr. Faulkner to use ceases. It destroys him while still there is some water left for Gov. Talbot. So that while their rights depend upon the same act and grow out of the deprivation of water at the same place, still the rules applicable to them of course will be somewhat different. commence, with a single exception to which I shall call your attention, in the case of Mr. Faulkner, I am prepared to say that I do not claim damages except for the deprivation for about six months in the year. I do not mean that the defendants would not be liable to pay damages for the deprivation of water through the whole year, as a matter of law. But when you come to see what the damages are, I think, looking at the case fairly, that with the single exception to which I shall call your attention directly, the claim for damages grows out substantially of what will happen within six months of the year. And it is for this reason, as I un-Taking the 346 miles of water-shed that derstand it. furnishes water to the river at Billerica dam, and depriving us of $72\frac{3}{10}$ miles, which is the proof here (although the city say it is 77 miles), taking the one-fifth out it will leave water-shed enough to supply us somewhere about six months in the year. Of course I cannot fix it with exactness, neither can any human being. I say it will leave water-shed enough to furnish for about six months in the year all the water that, situated as Billerica dam is, can be retained and used at that fall. The reservoir is limited, as I agree. Gov. Talbot has testified to you that ordinarily in low water, shutting down the dam at the end of work, it would ordinarily fill up the next morning. The reservoir is so limited that for about six months in the year I have no doubt, upon looking at the premises, it would be quite apparent that the two hundred odd miles of water-shed left would furnish us with all the water that we could retain and use with any degree of profit at that dam. So that the damages must be substantially confined to the deprivation of water for six months in the year. Of course two of you gentlemen know better than any of us can, precisely when the six months should commence and when they should end, though I don't believe any human being can tell precisely whether you should begin the first of May and end the last of October, or whether you can begin a little earlier and end a little earlier, or begin a little later and end a little later. But, coming at it as nearly as we can, it is about six months that we shall be affected by this deprivation of water, and six months when we shall not be.

Now, what is the quantity of water taken? How much is it that we are deprived of? Fortunately upon this matter I think (and I am aware that I am addressing two gentlemen here who know practically about it more than almost any one else, and were selected for that reason, and another gentleman who thoroughly knows the law in reference to it) — I say fortunately we can, I think, approximate in this case as nearly to the amount of water taken (we will come to the damages for the taking afterwards when we have shown how much is taken) as we can ever in any case where the taking water is the subject of the action and where the pre-

cise water taken has not been absolutely measured for a great length of time, so that you know, from the measurements of five or six years, exactly what the amount taken is. That we do not pretend has been done in this case. But we get at it in this way (and I desire you to follow me and see if I am not right) — we get at it in this way: There are $72\frac{3}{10}$ miles of water-shed to the Sudbury river taken by the City of Boston. All the water is taken. By the terms of the act, and by the terms of the taking, all the water is taken — not a portion of it, but the whole. The whole water-shed to the Billerica mills is 346 miles. So that you have one-fifth of that which supplies the water, and from which the supply must come, taken by this act of the City of Boston, and which will affect us practically in the use of the water, as I claim, — and I think I can show you clearly, for six months

in the year.

Now, upon another matter, I am not going to claim that the water-shed taken is any better, but upon all the evidence in the case, it is as good as the water-shed that is left. My proposition now is only, that in getting at the amount of water taken, the water-shed is as good and productive as that which is left. To prove that, sir, you have but to look at the rain-gauges taken at different points put in the Essex Company's case,—the Cochituate, which is the nearest to the water-shed taken by the City of Boston, and which is the only one in that neighborhood, the one at Cambridge and the one at Lowell, both of which are less; and I think, Mr. Francis, the one at Lowell is nearly seven or eight inches less than the Cochituate, which is nearest this water-shed. So that from some reason or other (why it is we don't know; it is sufficient that we take the fact) — for some reason or other the rainfall at or near the water-shed taken is larger, and has been larger for the last ten or twenty years, or since any gauge has been taken, than it is in any part of this water-shed. I am right, therefore, in saying this - that the water-shed taken is as good and productive as any portion of the water-shed left. More than that, taking the testimony of Mr. Mills and Mr. Storrow and others — Mr. Mills especially — as to the character of the land, he puts the water-shed taken upon the Sudbury river as more productive and better (I mean so far as the character and lay of the land is concerned, and the character of the soil) than the water-shed below the taking; because below there are very broad and large meadows where the water from the upland is liable to spread out upon the meadows, and is much more liable to evaporation than it is

above. I then have the right to say that the water-shed taken is as productive as the water-shed that is left.

We have two means of getting at the amount of water which that water-shed will yield. In the first place you have the experiments of the Essex Company, measuring for five years the water which they actually had. That, I suppose, is an approximation, and a pretty close approximation, to the water which they actually get out of their whole water-That is, the water-shed in New Hampshire, and that in Massachusetts of the Sudbury river and the Assabet river; and there being $\frac{1}{57}$ part taken of all the water-shed that the Essex Company have at their dam, provided the same rules and the same laws should apply to each part of the 4,126 miles of their water-shed, you then get at practically what this water-shed would produce at different points of time. have gone into that, and I only intend to use that calculation for this purpose, — to say that it brings, taking the average, slightly the largest product from this water-shed taken. Then, the other method which I have taken (and which I propose to put before you now) — the other method of getting at the amount of water yielded by that water-shed during the six months which we claim that it injures us and affects our property — is this: You take the rainfall at the Cochituate, which is the only one kept in that neighborhood, for the last ten years preceding 1875; you get the average of the six months beginning with May and extending to October, inclusive (in the taking of those months, I think you can see the practical difficulty, — while I agree that some years it will begin earlier in the spring and extend later, and that other years it will end earlier, still, adopting some rule, the taking the six months beginning with May and ending with October, and thus taking the six dry months, would be about as fair a way of getting at it as you could adopt.) I claim that upon the evidence in this case from Mr. Mills, and upon what is known to some of you, because it has been testified to so often that it is known to everybody who has ever tried any water cases, so as to become almost common knowledge, you get into the streams ordinarily in Massachusetts and in New England fifty per cent. of the rainfall of the whole year.

Mr. Mills testifies to you that it is from 25 to 30 per cent. for the summer months, July, August, and September. The New York experiments give you 28 per cent., but for the three summer months, say 25 or 30 per cent. Well, now, gentlemen, to make the matter as sure as you can any matter of this kind, where you can get only an approximation (you can by no possibility do anything more than get an approximation to the actual result), in order not to

make it too large, I have taken for the ten years previous to this time the average of the six months, at 25 per cent. only of the rainfall of these months, -25 per cent. saved into the streams, which I believe those gentlemen who are acquainted with such matters will say is liberal against myself. I then take the four summer months from June to September, inclusive, and I take but 20 per cent. of the rainfall of those months saved, — although the testimony is here that it is 25 to 30 per cent.; still, in order to make the thing as nearly right as I can, and be sure that I do not overestimate it, I take the lesser sum of 20 per cent. only of the rainfall. I then take the average of each of the months of June, July, August, and September, for the ten years separately, and take 20 per cent of the rainfall during those months, separately, and see what each one of them will give for the $72\frac{3}{10}$ miles taken, and for the whole 346 miles. You will see, gentlemen, that I take the six months at 25 per cent. of the rainfall; I take four months at 20 per cent. of the rainfall saved, and then I take each of the four summer months separately, at 20 per cent. of the rainfall saved, and see what the result is, and how much water there is, taking 20 and 25 per cent. of the amounts, so as to ascertain, if I can, what water we are absolutely deprived of.

Well, now, gentlemen, I want to deal with one other matter, at this point, — the matter of evaporation and loss in getting from the point where it is taken down to our pond, which is twenty odd miles. I think that was dealt with substantially by the testimony of Mr. Storrow, and in this way: There is water enough below the taking, coming in from the other sources, fully to supply the loss from soakage and evaporation; that as you pour it in, sir, at the point where it is taken you do not pour it in in sufficient quantities to flash over the meadows below so as to increase the surface exposed to the sun and air, or increase the surface exposed to soakage into the soil. You do not lose any more by evaporation when you have the whole amount of this water, that is taken at the dam by the City of Boston, in the stream, than you lose without its being poured into the stream. other words, you do not increase the surface exposed to the sun and air by pouring in this amount from above, or taking it away. It remains the same. Neither do you increase, to any extent, the surface to soak away into the soil. It keeps in the stream, and the surface is in both cases the same substantially. So that whether you have really the 20 or 25 per cent. taken by the City of Boston, you have the same loss by evaporation below. Whether you have this quantity from the above or not, you have the same loss

below. That is a constant quantity.

And I believe, as Mr. Storrow said, so long as you keep the quantity (as you do in the summer months) so small that it will not overflow the banks, or increase the surface exposed to sun and air and soakage of the banks, there is no increased loss from evaporation. If the water put in above has any effect, it rather decreases the quantity lost from evaporation, — because as you increase the depth of the water, to a certain extent you decrease the temperature, and evaporation depends to a certain extent upon the tempera-The warmer the water the more will evaporate. In increasing the volume you decrease, in summer, the amount due to evaporation, because the temperature would be somewhat colder; but I suppose that is an inappreciable quantity. So that all we have a right to say is this: that there is no loss of this water by evaporation, from the fact that under the circumstances of the case the loss from evaporation is a constant quantity, and the pouring in of this quantity from above does not add to that, or increase it in any way whatever. It remains the same.

I have myself gone over these matters shown in these written statements in my hand. They have involved a considerable amount of calculation, and I have had them verified afterwards by somebody else who knew better about figures than

I do. I only give you the results.

The first table is in reference to the six months and the whole water-shed of 346 square miles; and taking 25 per cent. of the rainfall saved, it gives 442 cubic feet per second at the Billerica mills, for the 24 hours. That is, the average, taking the whole six months, and taking 25 per cent. for ten years of the rainfall saved, gives you, for the whole water-shed of 346 miles, 442 cubic feet per second.

Take the same problem for the 72.3 miles taken (and here let me say to you that the city, in one of those documents which we have had here before us, for another purpose, puts

this water-shed at 78) —

Mr. Butler. Allow me to say a single word about that. It is in one of the documents. Mr. Davis made it 78, and all the witnesses for the plaintiff make it 72.5. That difference is explained in this way: the map has contracted, since it was made, by drying, and, as it turned out, just enough to make that difference. Mr. Davis measured upon the same map, and then took the various points in the water-shed (for he was anxious to find out how it was), and surveyed it and ascertained the area, as compared with the area of the map; and he found he had to increase it about that amount.

Mr. Abbott. What we are after is, what they have taken; and the result, if we got at the real measurement, would be that it would give us six square miles more by their measurements. I make the area 72.3, and have based all my calculations upon it; and in all these calculations, in getting at the approximate result, I have endeavored to have them made against my client, —and therefore I took the 72.3 miles, because Mr. Mills and Mr. Wooster testified to it, although I was aware that the city claimed 78.

For six months, taking the average of ten years, for the 72.3 miles taken, it would give 91.67 cubic feet per second for the 24 hours, reckoning at 25 per cent. saved for the six months. You see that is little more that one-fifth; — I say it in order that you may not be misled by that in any of the figures; 72.3 is a little more than one-fifth of the whole 346

miles taken.

Now I might as well go through with the results for the six months. I get the formula of 8.8 cubic feet per second over a one-foot fall, which is the exact measurement for a horse-power, as I understand; it gives you, for the six months, for the whole 346 miles, over an eleven-feet fall (which is our fall), 562.81 gross horse-powers. If you could get the whole power, you would have that amount; and for 72.3 miles, using the same formula, you have 115.36 gross horsepower, for the twenty-four hours; all these estimates are made for the twenty-four hours. The number of cubic feet of water left, after deducting the 72.3, is 350.33, and of horse-powers 447.45; i. e., the part of the watershed not taken will give you that number of gross horsepowers for the part left, for the twenty-four hours. then deduct 25 per cent. from that result, waste, etc. Mr. Holmes has testified that it is 75 to 80 per cent. that you get practically and effectively out of the gross; and I take 75 per cent. as I have heard it testified to by persons upon whose judgment I put a great deal of reliance, as what you get practically out of the gross horse-powers. gives you 335.55 as the effective horse-powers for the watershed, left after deducting the 72.3. The same rule, sir, gives 86.52 horse-powers effective, for the six months, for the twenty-four hours for the 72.3 miles taken.

I went through these calculations myself, and then had them verified, so that the figures might be right, and I think

I have given you them correctly.

Mr. Butler. Will you tell me how much you reckon a cubic foot over your eleven-foot fall? we reckon it at $\frac{9}{10}$ of a horse-power.

Mr. Abbott. It may be that; I have not measured it.

Now, you might as well take into consideration, in this connection, other facts. Mr. Talbot's gates, by his deed, when the water is below the bolt, taken from Mr. Wilson's deposition, require 405 cubic feet per second. Mr. Talbot, when the water is below the bolt, has a right to draw 405 cubic feet. And after deducting the amount for the 72.3 square miles taken, it leaves but 350.3 cubic feet on an average through the six months. That is to say, he has not by 50.1 cubic feet as much as he has a right to draw after the water gets below the bolt. Now, sir, the amount required for Mr. Talbot's present wheels, measured by Mr. Holmes, is 420.5 cubic feet per second. Mr. Faulkner's right by his deed is 57.3. That makes Mr. Talbot's present works, and Mr. Faulkner's present works, when the water is above the height of 3ths of an inch below the bottom of the bolt, require 477.8 cubic feet per second.

Commissioner Francis. You are assuming that the mills

run night and day?

Mr. Abbott. Yes, sir, I am taking the twenty-four hours. I am taking the average of six months. I am aware that a portion of the time we may hold back at nights. That I will come to afterwards. Then taking the average of six months, — after the city have taken their 72.3 miles, and got fairly at work, so that it will be effective for six months, we have but 350.3 cubic feet, making a deficiency for the six months of 127.5, — taking the averages, so that Mr. Faulkner would be out of the question entirely. You have not enough, on the average for the six months, to run as much as Mr. Talbot has the right to run when his water is below the bolt. And I am obliged, Mr. Chairman and gentlemen, as you see, to deal with averages to a great extent, as there is no other possible way in which you can get at results.

Now, take the four summer months,—June, July, August, and September,—take the average for ten years ending with 1875. We do not take this year, because it was not completed. Taking the years previous to 1875, and taking the average rainfall of those four months, and taking but 20 per cent. of that rainfall as the effective quantity which that water-shed will yield to us of water-power, I find that for the whole 346 miles, averaging it, it will give 343 cubic feet per second for the twenty-four hours, and applying the same rule to the 72.3 taken, it gives 71.72. The result is left, after taking out the 72.3 miles, of 271.28.

By adopting this course, you find for four months that you have left 271.28 cubic feet only, after taking out the 72.3 square miles, and that will produce 254.15 horse-powers

effective, and some little fraction; and the 72 miles taken will produce 67.32 horse-powers effective for the four months, that is, for twenty-four hours. Mr. Talbot's and Mr. Faulkner's wheels requiring about 480 cubic feet per second, you find the amount of water actually furnished leaves a very large deficiency. So, applying this calculation, and going through the four months, you find there is a deficiency of

water to furnish Mr. Faulkner anything,

Then I have gone through each of the four months of June, July, August and September, with precisely the same calculations, and the results are very nearly alike, except that you will find, as you would expect, in the month of August, it being in the average of years the rainiest month of the year, considerable gain. You will find that in the month of August the effective horse-powers amount to 85.66 for the part taken. Taking that particular item, the amount in June would be 58.85; in July it would be 65.08, and in September 60.72, — for the average of ten years. That is for the amount taken, - the effective horse-powers. The result of it is that, for the four months, you get, for the amount taken, for the twenty-four hours, by taking twenty per cent., seventy-one and some hundredths cubic feet, and of effective horse-powers, 67.32. Now, in order to make the approximation as certain as I can, I have gone to work and obtained the results from the Essex Company of the amount of water absolutely saved for five years. I found the result of averages there, by taking one fifty-seventh part of them (because they say the land taken is but one fiftyseventh part of the whole water-shed) gives a larger amount in cubic feet per second than the rainfall. to it the rule which I have applied before; for example: the Essex Company, for six months, for 72.3 square miles, taking the average for five years, would give you 121.46 cubic feet, against 91.6 given by the rainfall. And for the four months the Essex Company's experiment gives, taking the average of all the years together, 86.76; while the rainfall for the same time, taking the saving at twenty per cent. for the average of ten years, gives 71.72. The 121.46 was in the Essex Company's experiment, where they measured the exact quantity of water they had. I take one fiftyseventh of that, and then for the four months the Essex experiment gives, by applying the same rule to it, 86.76, and the twenty per cent. of the rainfall gives 71.72. I do this for the purpose of showing that, as far as you can get at any rule for approximation, the rule I have adopted for rainfall does not produce too large an amount. I am aware that you cannot say positively that this one fifty-seventh should produce precisely in the same time the same proportion as all the other parts; but I say, adopting it as a rule, it produces

larger results.

Then I want to go farther and take the minimum of the Essex Company's water for the 72.3 miles. Mr. Mills testified that that minimum was 45 cubic feet per second for the twenty-four hours. I find, taking that as given in those tables as the lowest amount that $\frac{1}{57}$ th part of the Essex Company's water-shed will produce per second — the lowest amount it ever gets down to — is 45 cubic feet per second. And I find that out of the five years there are only a few days when it will get down as low as that for the 72.3 miles, and that is for the twenty-four hours. That is $\frac{1}{57}$ th part of the 2,300 cubic feet per second. I take the smallest amount — the minimum; and you will find only a very few days when it is anywhere down in that neighborhood for the twenty-four hours.

Now, I think I have a right to put it to you, gentlemen, practically to say, that when there is furnished from that water-shed but 45 cubic feet per second for the twenty-four hours, and that is the minimum, and but a few days in five years—that we can use the whole twenty-four hours in twelve hours. You can effectively use that amount in twelve hours. You can use the whole twenty-four hours' supply in twelve hours, which would double it. When you get down to the minimum,—and I am now dealing with the very smallest amounts which, according to the Essex Company's experiments are ever yielded,—you get 90 cubic feet for a working day of twelve hours (not calling it ten), and that will give you 84.34 effective horse-powers for the

twelve hours net.

In these calculations there is nothing else but exactly following out what I went over at the first; and from these calculations we are brought to this result substantially (and you will see whether I am right or not) in attempting to get at the damages. You take six months, and you find by the averages (and I must deal with averages because it is utterly impossible to go farther into particulars), — you find by the averages that we have not water enough left for those six months to run during the whole time, - not enough by a large amount. You have not water enough to run the wheels that Mr. Talbot now has, and has a right to run when the water is running over the dam. There is quite a large deficiency, a calculation of which you will have here in the tables now in my hand, and which I shall hand to your Honors. You find also that, taking the amount of water that Mr. Talbot has the right to use, when

the water is below the bolt, and when Mr. Faulkner is stopped, for the six months on the average there is a deficiency of water there, to run the power that he has a right to

use, of something over 50 cubic feet per second.

Now I want to deal with Mr. Faulkner, just at this moment. Of course the deficiency is very much larger when you take the four months, or when you take each of the summer months, with the exception of August. There is a deficiency if you take the average of the six months, of the four months, or of each of the summer months separately. There is a deficiency of water, on the average, to run the whole of the machinery of Mr. Faulkner and of Mr. Talbot.

Now Mr. Talbot testifies to you (and he knows probably as much about it as any one else, or as any one can know from observation), in his belief, and from the best of his observation, it would increase the time that Mr. Faulkner is without water, by depriving him of one-fifth substantially from forty days in the year to six months. That was but an opinion formed from observation of the running of the water as it has been before him for years since he has owned it. Now, by taking in all these results, — the Essex Company's exact measurement, or taking the measurements which I have given you of the rainfall, twenty-five per cent. for six months, twenty per cent. for four months, and for each of the four months, - you will find that on the average by taking one-fifth, and there is not water enough left to run what Mr. Talbot himself has the right to run when the water is down below the bolt. Therefore, I say, that as near as it can be proved for practical purposes, I do establish this fact by the opinion of Gov. Talbot. Then that opinion is sustained and strengthened by the deductions from the rainfall, taking them as I have made them, and from the Essex Company's experiments, — that if you have one-fifth part of that watershed taken away, supposing it is not more productive; taking it away as the city will take it away when they get fairly into operation, you will deprive Mr. Faulkner of water for six months at least. He is now deprived of water for the last twenty-three years, for an average of thirty-three days in the year. It will increase that deprivation from thirty-three days up to six months, beyond all peradventure.

Let me say this also: That from the necessity of the case we are dealing and must deal with approximations, I was going to say with guesses, to a certain extent, and we must deal with them carefully for this reason, that we never can get anything for Mr. Faulkner except what we get now; and if we should happen to carry approximations beyond the

mark, and it should happen that this deprivation of one-fifth would extend the time when there would be a deficiency to Faulkner's mills, for more than six months, why it is a loss to him without any possibility of its being made up to him. Therefore I say that in all these calculations I should have been justified in taking a little more liberal rule than I have adopted, for the reason that this is, after all, approximation and guessing, and that if the guesses are against us now they never can be remedied in any shape whatever. I only allude to this in order that you may properly apply the rule and see that everything fair is given to both these gentlemen. Now in this matter of Mr. Faulkner I said that besides the six months there was one other matter applying to him which I wanted to call your Honors' attention to, and that is that in the winter Mr. Faulkner has been, and very probably will be again, affected by this deprivation of one-fifth of this water.

The winter months, as you will find by taking the average for the last ten years, are the dryest months in the whole season, i. e., there is less raintall in the three winter months than in any three months of the whole season. Take the last ten years, the average of rainfall for December, January and February amounts to a little less than ten inches, at the same time the average for the year is a little over fifty, making one-fifth for that quarter of the year. The average for December is a little over three, for January a little over three, and for February three and six-tenths. They are the dryest months in the year. Now it so happens that more of the water is saved for those months than during any other months in the year. If it should happen, as it sometimes does, and as it did in 1875, that there is a dry winter, - a very hard winter, where it freezes up and there is no January thaw, which ordinarily keeps things right in winter, - you will certainly have Mr. Faulkner cut off during the winter months, as he was in 1875, when all these things occurred.

Now I said that, with the exception of something which was applicable to Mr. Faulkner, the damages would be confined to deprivation for six months. I think in that case, in order thoroughly to protect him against what has occurred and what will occur again, you should make some allowance for loss of water in the winter months; because if it should so happen that we should have such a winter as we had in 1875, cold, hard, and without any thaw to bring down the water, you would just as certainly, for the months of January and February, have him deprived of water, as such an event should happen. Therefore there should some allow-

ance be made to him for loss of water in the winter months. I put it to you, gentlemen, whether there is not that degree of probability to it that compels you to make allowance on his behalf for some loss in the winter. I do not claim that during the six months, so far as Mr. Talbot is concerned,

it will affect him, although it may somewhat.

Now, gentlemen, what damages shall be given to these gentlemen for a deprivation, such as I have endeavored to prove before you, and of the result of which you will have an exact estimate rendered. Taking Mr. Talbot's case first, you have, I think, reasonably ascertained, or as nearly as an approximation can be made, and verified the result, that there are sixty odd effective horse-powers, for twenty-four hours, that he is deprived of. You have the fact, by this approximation, shown you as well as it possibly can be from the nature of the case, that all the power and all the surplus power for six months can be used by him; because, taking the average of it, his present means and appliances will use up all the power there is for six months (I don't mean that at some days there may not be a freshet when there will some water run to waste, but, taking the average, you find that his present appliances and wheels, with Mr. Faulkner's, will more than use up all the water that is furnished); therefore I say that as far as he is concerned, for six months in the year, he can use, and will use, all the water. Yes, one-fifth of the water that the City of Boston will have taken when they fairly get to work and have their three dams built and their three reservoirs so as to do that which they have a right to do, to wit: take all the water of Sudbury river above that point, - they will take it for six months, perhaps they will take it for the whole year round, - but for six months he can use all that water-power, and use it efficiently and effectively. How much can he use? I have shown you, to start with, that for six months that water-shed taken will give you eighty odd effective horse-powers for the twenty-four hours, or for the four months, sixty-five horse-powers and some odd, for the twenty-four hours. I have shown to you that by the Essex Company's experiment, at the minimum, i. e., taking the lowest time that for five years has ever been known, it will give him, say, eighty-five effective horse-powers, from that water-shed, for twelve hours. All the others would be for twenty-four hours. That, sir, happens for not more than four days in the whole five years. I doubled that, from the fact that when it gets down to forty-five cubic feet, nobody will claim that the mill-owners could not use that forty-five cubic feet in twelve hours.

To recapitulate: I have shown you that for six months

the 72.3 miles taken will give eighty odd horse-powers for twenty-four hours. For four months it will give you sixtyfive horse-powers for twenty-four hours. I have shown you that the minimum, which does not come but for a few days in the five years, will give you for twelve hours eighty-five effective horse-powers. And now, sir, I ask, is it unfair, is it claiming too much, when you claim, as I claim here in Mr. Talbot's behalf, that as to the effective use of that water, we have a right to say, that, year in and year out, for the working-days of the year, situated as he is, seventy-two miles of water-shed (or seventy-eight miles, or whatever it may be) will yield him for the working hours of the day 100 horse-powers. It gives him, for the four months, sixty-five or sixty-seven horse-powers for the twenty-four hours. And for twelve of the hours, at the minimum, where it is at the lowest amount that it ever reaches, it gives him for the twelve hours eighty-five horsepowers.

Now, my belief is, that a claim larger than that could be fairly justified upon the evidence. You have this claim for twenty-four hours, and you can use it for twelve hours, and so you will increase it to a certain extent. Do not these results, gentlemen, give you substantially a deprivation for Mr. Talbot, six months in the year, of 100 horse-powers, which he could use, undoubtedly, during twenty-fours hours

in the day.

They laugh at the idea of taking seventy-five miles of water-shed causing damage. Why, four miles of water-shed in Arlington was taken, — and I believe two of you, gentlemen, gave some \$120,000, or more, for it. It was a larger fall, I agree. They come here and take seventy-eight miles of water-shed and would make you believe that it amounted to nothing, — as my brother Butler says, even less than \$5,000, or something of that sort; when, in point of fact, gentlemen, anybody who knows about the use of water, and knows the purposes to which it is applied in the neighborhood where these works are, would know that it is not only valuable, but the more valuable, if you please, from the fact that water can be afforded at twenty dollars a horse-power, when steam will cost \$100 a horse-power to produce it.

Now, as far as the Talbots are concerned, I say that from the results of those calculations (and I ask you to examine them carefully, and see if I have not been liberal in favor of the city and against my clients), I say, I have the right to claim a deprivation of what will amount to him, practically, as a manufacturer and the owner of those works, of a hundred horse-powers, independent of Mr. Faulkner. And

he is to be paid for that.

Now, what is he to be paid for it? Why, gentlemen, you cannot undertake to give him damages for that in any other way than this: Here is a plant, as it is called, on which he has expended \$400,000, which, in the ordinary state of things, would be worth that undoubtedly; and if he is obliged to give that up, or to give a portion of that up, why, the damages to the whole concern would be such that you cannot give those damages. It would be too large a sum. Taking away one hundred horse-power would substantially destroy Mr. Talbot's works. He occupies them altogether. If he has to remove one he would the whole. I only put in the fact that there was a \$400,000 investment in the plant for the purpose of showing you that the damages must be made up upon the basis of supplying the power to that manufactory and to those works which had been taken by the act of the city, i. e., supplying the one hundred horsepower.

Well, now, upon this subject, my friend, instead of bringing evidence, has told you that you know, and everybody knows, what the cost of steam-power is. I should rather have had some evidence, and somebody to contradict Mr. Holmes, instead of the mere saying that, "you know better, and everybody knows better," and that it does not cost as much as Mr. Holmes testified to maintain steam-power. Mr. Holmes tells you, that, to maintain steam-power, it will cost from \$110 to \$115 a year per horse-power, which includes the reproduction of it. That is calling the depreciation ten per cent. Nobody has testified to the contrary; and I can say that, so far from "everybody knowing that that is not the truth," having, fortunately or unfortunately for my clients, been called upon to try a great many cases within six months where this question was involved, and where there was a sharp and close contest, I have never heard anybody put the cost of a horse-power under \$100, including depreciation, anywhere in the neighborhood of Boston. Placing coal at \$8 a ton, I have never found anybody that ever put the cost of maintaining a horse-power, at less than \$100, including depreciation; and more frequently it goes up to \$125 than comes down to \$100. Holmes has put it at \$110 to \$115.

Now, I maintain, gentlemen, and you are to say whether it is not a fair claim, — it is the only way you can get at the damages, — that they have deprived us of a working-power of one hundred horses during the working hours of the day. They are to give us a sum which will reproduce that one

hundred horse-power which they have taken from us. Apply to it the rule, and the only rule which you have here — the rule given by Mr. Holmes - and it will give you, say \$60 a year per horse-power. For six months, or one hundred and fifty days, take it upon the basis of \$110 per horse-power per year for half a year, it would be \$50 per horse-power — the depreciation being admitted to be the same whether the engine is running or not running. The depreciation added gives us \$60 per horse-power. Then, in addition to that, Mr. Talbot has not any steam. He is not now obliged to put in any steam. He can run and get on at present without any steam. He can run his mill. It has never been stopped or interfered with but twice since he built it. Once was when the city took his water in 1875. He was then disturbed a little with his machinery. The other time was when we went up to view it this fall. He has always managed to run his mill and his dye-works part of the time, and run them at night. He has managed to get on without steam, and he has none, and therefore you are to pay him for the cost of putting a 100 horse-power steam-engine in. A 100 horse-power engine, according to Mr. Holmes, who is the only witness on that point, would cost \$20,000. And another condition is, that in applying the steam to the mill, there will be an interference with the use of the mill, which Mr. Talbot estimates at \$10,000; i. e., he would not have that interference with a mill of the size of his present mill for that amount. Then capitalize the sum which he is entitled to -100 horsepower at the rate of \$60 a horse-power per year — take it at five or six per cent. as you may think best, which is the only way we can get at it, and I say we are entitled fairly to that amount. And I defy any one, going over this matter, and approximating it as we necessarily must, to get at any fairer or better result. I claim that you have taken so much power from us. Our works are the losers by so much, and we must have that power restored to us or else the works will be completely ruined. And you must supply us with the power. It is not one of those cases where you can undertake to estimate the damages without supplying the mill with steam-power, because the damage done will substantially destroy the whole property, except the machinery, from the loss of power. That is the claim on his part; and I ask your attention candidly to it to say whether, taking the only evidence that you have to deal with, there has been any error in my calculations, or if there has, whether I have not erred against myself in these estimates that I have made, I am quite sure that you will come to that result.

Now I want to come to Mr. Faulkner's claim and deal a

little with that. His claim for damages depends upon different principles somewhat. He is entitled to 57.3 cubic feet of water per second, while the water is up to a point three quarters of an inch below the bolt, and then he is entitled to draw nothing. Well that 57.3 cubic feet of water, taking 75 per cent. of the gross result as the effective result, produces in round numbers 54 horse-powers on an eleven-feet fall. is a fraction short of 54, but near enough for all ordinary purposes. You take the effective 75 per cent. from the gross and it gives you for him 54 horse-powers. He has just about that amount of machinery running in his mill. He is requiring 55 horse-powers as running at the present time. Well, I agree that in his case — it is not like Mr. Talbot's, who now has no engine and is not required to have any — I agree that Faulkner under his right at the present time, in order to run his mill constantly, is obliged to have an engine. This bears upon the question — because in this smaller mill of Mr. Faulkner, for thirty-three days per year, rather than give up the mill, he uses his engine to supplement the water-power. It shows that I am right in saying that you must give us an amount which will furnish steam-power for this water-power which we lose. must use steam-power, when now he can get water and run. It turns out by the records kept, that for the last eleven years there have been forty days on the average in each year when he has been obliged to run his steam-engine. you go back twenty-three years the average will be about thirty-three days. It is just thirty, I think, for the last ten or eleven years.

Well, now, I suppose it will be claimed on the other side, that Mr. Faulkner is not entitled, at your hands, to start with, to the expense of a steam-engine. It may be claimed that he is not entitled to the expense of depreciation; i. e., that dealing with him, as the city find him, — they go there when they take the water, and they find that he has already been obliged to get an engine, because there are forty days in the year when he must run an engine, - therefore, when they come and require him to run an engine, as I have shown you, for six months, and something more to be allowed in the winter, that you are not to do as in Mr. Talbot's case, pay him for getting that engine new (Mr. Talbot never having had any); that you only require that engine to be run a greater number of days; to wit: during the six months, which would be 155 days, taking the holidays and all, which would be about 112 days more than he now runs the engine, aside from the winter months. Now, I want to call your attention to this fact: Taking the matters

just as they are in Mr. Faulkner's case, he claims this, and I think with a great deal of propriety and justice, he says, "running forty days in the year, my old engine will do my work. I can get along very well with it. It is as good now as it was when it was new. By repairs I have kept it up," — and that undoubtedly is true. He will run with his old engine, if you let him work as before, forty odd days in the year. But if you bring about a state of things where he has to have his mill run more than half the time by steam, he has got to make new appliances, and connect it in a different way, and under different circumstances; so that you compel him now to make a new expenditure in reference to that matter, which he would not be obliged to make if it were not for the act of the city. There is certainly truth and justice in that claim. Practically, it is true beyond all question. Practically, Mr. Faulkner would not think, at the present time, of obtaining a new and larger engine. He would keep on as he has, for forty days in the year, if he could be let alone. If he has got to turn that into 155 days, he would be obliged to make new arrange-The same observation applies to his case as to that of Mr. Talbot. His investment is so large, that his works are substantially worth nothing after this taking, unless he runs by steam. He must be supplied with steam. He has a right to claim, with an investment of that sort, that if you take away his power to that extent, you must supply him with steam-power to fully compensate for it. The damages would be larger the other way, than they would be if they were met by supplying him with steam.

Now, what shall be the measure of damages for him for this additional length of time during which he is compelled to use steam? For clearly in his case he will be compelled to use steam six months, and more than six months, because it will run into the winter, where heretofore he has used it but forty days in the year. You have again the testimony of Mr. Holmes (which is not controverted or quarrelled with by my friend on the other side) you have his testimony that the cost of running a fifty horsepower engine (fifty-four horse-power is the amount that he is deprived of) is \$13.60 for coal, engineer and oil, - simply for the cost of running, with one man, who supplies the place of fireman and engineer. You add twenty-five cents a day for repairs (which were not included), and it amounts to \$13.85; and then if you add four horse-powers more (making fifty-four horse-powers), it is \$1.08 more, making \$14.98 per day as the actual expense of running an engine, and the

daily repairs, without any depreciation, or expense of putting

an engine in.

Now, for the balance of the six months, after deducting the thirty-three days, you have 122 days, which, multiplied by \$14.96, gives \$1,825.12, which will be his additional expenditure, without any depreciation, without any expense for building and putting in the new engine, or any trouble of that sort, and without any allowance for stoppages that would certainly come, perhaps in every year, but at any rate from time to time in the winter, and for which an allowance should be made to him. That, capitalized at five per cent., will

give you thirty-six thousand dollars and over.

Now, in addition to that, I claim in Mr. Faulkner's case, that he should be allowed something (I don't claim the yearly depreciation of ten per cent., because I don't think it would be fair to claim that, and I don't think he would want me to claim anything I did not believe was fair),—but I do claim something for him for this: That whereas, by the act of the city, he is compelled to make new and larger expenditures than he would be compelled to make without the act of the city, that some allowance should be made for those expenditures. No human being can tell you the precise amount. That must be approximated. But that he is entitled to something on that ground, I claim beyond all peradventure.

Then one other matter. I claim that for the winter (again, I say, I cannot measure the claim as I can in the case of the 122 days) — I claim that for the winter he should be allowed something additional; because I think it is as certain as anything can be in the future, that in every year he will be stopped in the winter. He will be stopped a few days, and be obliged to run his steam-engine; and as he is to receive pay now for damages sustained, I think something should be given him on this account at the present time. Again I say some allowance should be made to him for that stoppage in the winter time. I only call your Honors' attention to it, and to the evidence bearing upon it, and your Honors must fix it as well as you can.

Then there is one other matter that I think he is entitled to receive pay for, and that, I think, Mr. Talbot is, to a certain extent, entitled to receive pay for, though not to the same extent as Mr. Faulkner; because Mr. Talbot, in the case of a break-down of his steam, can always apply water to some of his works. It is this: That with one engine, and the constant liability of the engine to break down, there is something to be allowed to him for that additional liability in 122 days. Well, you may say that that is going into the region of guessing. I agree that it is

not measured by any certain rule. You cannot tell how much time he will lose by the greater liability to stoppage from the use of steam-power than there is with such mill-dam and wheels as he has now. But then, I take it that nothing is more certain in this world, — and I think that every manufacturer who has ever used steam and water power will tell you that it is perfectly true that there is a greater liability to stoppage, and to losses from stoppage, where you depend upon only a single steam-engine, than where you depend upon water-power, as that water-power is used here. As it turns out, I believe that in investigating this matter it will be found that there has been, for the last twenty odd years, only three

days of delay from back-water in that stream.

Now these are the elements that I desire your Honors to look at carefully. In the case of Mr. Faulkner, the 122 days is certainly a matter from which there is no escape. The other elements, I think, are fair. I think it is right that he should have some compensation for them. I cannot measure them as I can other things in relation to this mill. They must be left to you. But I claim that the court should make some allowance to him for the winter deprivation, — more or less, as the case may be, — from the fact that he is obliged to make new appliances, and put in new and larger steamengines, boilers, etc., than he would if it had not been for the act of the city, and the increased liability to breaking down from the use of steam-power, over and above that resulting from the use of water.

I am sorry to have detained your Honors so long; but I have been as brief as I possibly could be, and go over these matters in such a manner as to do justice to my clients.

24 hours.

No. 1.

24 hours.
Cu. ft. per sec.
6 months, 346 miles of water-shed, taking 25 per cent. of rainfall saved, gives average of 10 years ending 1875
Same time for 72.3 miles taken, same rate
Amount left after taking
8.8 cubic feet per second on 1-foot fall, gives 1 horse-power, and gives for the whole 346
miles, on 11-feet fall, horse-powers
For the water-shed left
335.55 effective.
72.3 miles taken gives gross horse-powers 115.36 gross. Deduct, as above, 25 per cent. for waste 28.84
Gives effective horse-powers 86.52 effective.
Talbot's gates, by his deed, when water below
bolt, require
Amount required for present works 420.5 cub. ft. Faulkner's 57.3
Amount left after taking
Deficiency
If you take 78 miles as weter-shed taken as hy City Engineer's

If you take 78 miles as water-shed, taken as by City Engineer's report, it adds 6.7 cubic feet per second for water-shed taken, or 98.87 instead of 91.67 cubic feet per second, or 6 horse-powers net in addition.

No. 2.

4 months (June, July, August and September)	on 346	miles	t. per sec.
water-shed, taking 20 per cent. of rainfall save	d for av	rerage	949.00
of 10 years ending 1875	•		$343.00 \\ 71.72$
Amount of water left after taking	•	•	271.28
8.8 cubic feet of water on 1-foot fall gives 1 horse-power, gross, and on 11-feet fall for whole 346 acres, gives gross horse-powers .	Horse-p	gross.	
For 72.3 miles taken, it gives gross horse-powers, Horse-powers for water-shed left, gross Deduct 25 per cent. for waste to get effective	338.86		
horse-powers	$\frac{84.71}{254.15}$		7e.
2 of all of the control and the post of the control and the co			-

72.3 miles taken giv above Deduct 25 per cent. Gives for water-shed?	for waste .		. 89.76 . 22.44
Talbot's gates, by deerequire Talbot's present wheefaulker's	els require .		405.00 cub. ft. p. sec. 420.50
Amount of water-pow	ver left after tal	king .	477.80 . 271.28 . 206.52
If you take water-s	shed at 78 mil s, it gives 77.3	es, as per 2 cubic fee	City Engineer's report, t per second instead of

No	•	3.
----	---	----

No. 3.	24 hours- Cu. ft. per sec.
June average 10 years ending 1875, 346 squar shed, taking 20 per cent. of rainfall saved . 72.3 miles taken same time	e miles water-
	234.29
8.8 cubic feet per second on 1-foot fall gives 1 gross horse-power, and on 11-feet fall gives	Horse-powers.
for whole 346 acres gross horse-powers	369.6 gross. 77.5
Deduct 25 per cent. for waste, to get effective horse-powers	292.1 73.0
Effective horse-powers	219.3 effective.
72.3 miles taken gives gross horse-powers Deduct 25 per cent. for waste, as above	77.5 19.4
Effective horse-powers	58.1 effective.
Talbot's gates, by his deeds, require when water below bolt	405.00 cu. ft. p. sec.
	420.50 57.30
Amount left after taking	477.80 " " " <u>" 34.29 </u>
Deficiency	913 51

No. 4.

2101 21	24 hours.
July average 10 years ending 1875 for 346 taking 20 per cent. of rainfall saved . 72.3 miles taken gives, same time	Cu. ft. per sec.
Amount left after taking	
	Horse-powers.
8.8 cubic feet per second on 1-foot fall gives gross horse-power, on 11-feet fall for 346 acc gives gross horse-powers 72.3 miles taken gives gross horse-powers.	s 1
Gross horse-powers for water-shed left Deduct 25 per cent. for waste	. 330.53 . 82.63
Gives effective horse-powers	. 247.90 effective.
72.3 miles taken gives gross horse-powers . Deduct, as above, 25 per cent. for waste .	. 87.47 gross. . 22.39
Gives effective horse-powers for land taken	. 65.08 effective.
Talbot's gates, by his deed, when water belobolt require	ow . 405.00 cu. ft. p. sec.
Talbot's present wheels require Faulkner's	. 420.50 . 57.30
Amount left after taking	477.80 . 265.00
Deficiency	. 212.80
No. 5.	
August, for 10 years ending 1875, average for	24 hours. Cu. ft. per sec.
346 acres, at 20 per cent. of rainfall saved	437.35
72.3 miles taken same time	91.38
Amount of water left after taking	345.97
8.8 cubic feet per second, on 1-foot fall, gives of horse-power gross, and on 11-feet fall gives	for
346 miles, powers	. 546.4 gross. . 114.21 "
Amount of gross horse-powers for water-shed l Deduct 25 per cent. for waste, to get effective hor	·se-
powers	. 108.
Effective horse-powers	. 324. effective.
72.3 miles taken, gives, as above, gross hor powers	se- . 114.21 gross.
Deduct, as above, 25 per cent. for waste .	. 28.55 effective.
Effective horse-powers	. 85.66 "

Talbot's gates, as per deed, when water below
bolt, take
Talbot's present wheels
Amount after taking
Deficiency
No. 6.
24 hours. Cu. ft. per sec. September average for ten years ending 1875, for 346 miles,
taking 20 per cent. of rainfall saved
Amount of water after taking
Horse-powers.
8.8 cubic feet per second, on 1-foot fall, gives one gross horse-power, and on 11-feet fall, on whole 346 miles, gives gross horse-powers . 387.2 gross 72.3 miles gives gross horse-powers . 80.96 "
306.24 "
Deduct 25 per cent. for waste, to get effective horse-powers
Effective horse-powers
72.3 miles taken gives gross horse-powers 80.96 gross Deduct 25 per cent. for waste, for effective horse-
porrors
Effective horse-powers 60.72
Talbot's gates, as by his deed, when water below bolt, require
Talhot's present wheels require
477.8 Amount left after taking
Deficiency
•
No. 7.
6 months, 25 per cent. of rainfall saved:—
Talbot's present mills require cubic feet per second
Add Faulkner's
Total required 477.8 cu. ft. p. sec.

	Actual amount after dedu Actual deficiency .					•	$350.3 \\ 127.5$	cu. ft. p. sec	Э.
	Talbot requires when wa Actual amount supplied						405. 350.3	**	
							54.7 d	leficiency.	
Jı	une, July, August, Septer	mber,	4 m	onth	s, at	20			
	per cent. saved:— Talbot's wheels require						420.5		
	Faulkner's	٠	•	•	٠	٠	57.3		
							477.8		
	Actual amount supplied miles	l after	de	ducti	ng 7	72.3	271.28		
		•	•	•	•				
	Deficiency	•	•	•	•	•	207.52		
	Talbot's right when water Actual amount supplied	er belo	w be	olt re	quir	es, 72.3	405.	cu. ft. p. se	Э.
٠	miles	•			•	•	271.28		
	Deficiency	•		•	٠	•	133.72		
Jı	une at 20 per cent. saved	:							
	Talbot's wheels require Faulkner's	•			•		$420.5 \\ 57.3$	cu. ft. p. se	c.
							477.80		
	Actual amount after dedu	acting	72.3	mile	es tal				
	Deficiency.	٠	٠	٠	•	٠	243.51		
	Talbot's rights when wat Amount actually furnished	ter bel	ow k er tal	oolt r	equi	res,	405. 234.29	cu. ft. p. se	c.
	Deficiency.	•					170.71		
J	uly at 20 per cent.:—								
	Talbot's wheels require Faulkner's	: -		•			$420.5 \\ 57.3$		
							477.8		
	Amount actually supplies	d after	m de	duct	ina !	70.0			
	miles	· ane				12.3	265.		
	Deficiency						212.8		
	Talbot's right when water	or hole	ow h	olt m	anir	•A8	405.		
	Actual amount furnished taken					rere			
		•	•	•	•				
	Deficiency	•	•	•	•		140.		

Αı	igust at 20 per cent.:—								
	Talbot's wheels require						420.0	cu. ft. p.	sec.
	Faulkner's		•				57.3	_	
							477.80		
	Amount furnished after	takino					345.97		
		8	•		·	Ť			
	Deficiency	•					131.83		
	Talbot's rights when wa	iter bel	ow l	bolt r	equir				
	Amount furnished .	•	•	•	•	٠	345.		
	Deficiency						60.		
	2 onorono,		•	·	·	·	00.		
So	ptember at 20 per cent.								
	Talbot's wheels require						420.5		
	Faulkner's	1					57.3		
	Amount furnished after	talrin a					477.80 245.84		
	Amount furnished after	taking	•	•	•	•	240.04		
	Deficiency						231.96		
	v								
	Talbot's rights when wa	ater bel	low '	holt			405.		
	Amount actually furnish			•			245.		
	5.04								
	Deficiency	•	•	•	•	•	160.		

Essex Company's Experiments.

Average for 5 years; average of 6 months, from		
May to October inclusive, gives for 72.3 square		
miles	121.46	cu. ft. p. sec.
The rainfall per average 10 years at the rate of		*
25 per cent. saved, gives for 72.3 square miles	91.6	6.6
Essex Co.'s for 4 months, June, July, August and		
September, for 5 years, average gives	86.76	66
The rainfall same time, taking saving at 20 per		
cent. for average of 10 years gives	71.72	6.6
8 8		

Essex Co.'s minimum of water for 72.3 miles, taken as testified by Mills, gives 45 cubic feet per second for 24 hours, and this only

for a very few days in five years.

This for 12 hours gives 90 cubic feet per second, or 84.34 effective horse-powers for 12 hours.

Rainfall for December, January and February, average 10 years,

9.97 inches. December, average 10 years 3.040 inches. January, " " February, " " . 3.274 3.668

9.972

Essex Co., minimum of water as testified to by Mills; and this only for a few days in 5 years for the 72.3 miles taken, gives 45 cu. ft. per second for 24 hours.

This for 12 hours gives 90 cu. ft. per hour, or 84.34 net horse-powers for

12 hours.

Talbot's Claim for Damages.

100 horse-powers engine, and ready to run Costs \$100 per year per horse-power to run Costs \$10 for depreciation, or \$110 per year	n engir	ie.		st pe	er horse-
power per year.					\$50 00
6 months? cost of running	whole	or	part	of	φου ου
the year					
Cost of running and maintaining per hors	e-powe	r for	6 mo	nths	, \$60 00
Yearly cost for each 6 months for 100 hors	e-powe	r en	gine,	\$6,0	000.
At 5 per cent. this requires a capital of.				. (\$120,000
Cost of engine, etc					20,000
Cost of engine, etc		•	•	•	10,000
				-	\$150,000

At 6 per cent. \$20,000 less, or \$130,000.

Faulkner's Claim for Damages.

His power lost for six months amounts to 54 net horse-powers, being 57.3 cubic feet per second on 11-feet fall.

For the last 23 years they have used an engine on an average for 32.5

days per year; for the last 11 years, 40.8 days per year.

By Holmes's testimony, 50 horse-power engine costs \$13.60 for coal, engineer, and oil; add 25 cents for ordinary repairs, makes \$13.85 per day; for an addition of 4 horse-powers, \$1.11, making for a 54 horse-

power engine, \$14.96 per day.

Faulkner is deprived of this 6 months in dry months; 6 months, from May to October inclusive, gives 156 working days; deducting the average of the last 11 years, 40.8 days run by steam, it leaves 115 days additional days to run by steam; or at average for 21 years, 32.5 days, it leaves 123 days to be run by steam.

115 days, at \$14.96 per day, gives 123 " " " "				\$1,714 1,834	per year
At 5 per cent., 115 days requires a	capital	of			\$34,283 36,681

Add to this some part of cost of new engine and larger one. Add some part of winter months' stoppage.

Add for greater liability for stopping by breaking down.

Memoranda of days J. R. Faulkner & Co. have run their mill at North Billerica with steam-power from 1853 to 1864 $inclusive-12\ years$.

	n July 1		ays		•	•		•		•	•		1,44
1855, in	a Aug.,	3 day							•				414
	n July, o steam		Aug.,	, 4	•	•	•	•	•	•	•	•	64
1858,	6.6												10
1860, n	n Aug., o steam	ι.			•							•	18
1861, in	n July, n June,	$24\frac{1}{2}$;	Aug	., 9;	Sept.	, 19 12.	Nor	. 91	· Dec	. 19	,		52½ 77½
1863, in	n March n June,	13 da	ys		•	., 12,		•, 27	, Do	•			3
1864, ii	n June,	2; J	uly,	24; A	ug.,	26; \$	Sept.,	, 24;	Oct.,	11	•	•	87
												6	3003

300 days in 12 years average 25 days per year.

BOSTON, Tuesday, Oct. 10, 1876, 10.20 A.M.

THE STERLING MILL, PARKER, WILDER & CO.,
PETITIONERS FOR ASSESSMENT OF DAMAGES,

vs. THE CITY OF BOSTON.

OPENING ARGUMENT OF GEORGE O. SHATTUCK, Esq., FOR THE PETITIONERS.

This is the case of the Sterling Mills, of Marshall P. Wilder and others. The peculiarity of this case as suggested by the counsel for the city, at the view, is, that it is based on lease, but it is a lease for the term of fifty years from the first day of January, 1865, so that it had on the first day of January, 1875, forty years to run. I do not represent the owner of the reversion, and therefore we shall be entitled to recover the value of the damage to the leasehold for the term of about forty years, which, I suppose, will be between ninety and a hundred per cent. of the whole value. The petition is in the usual form. I have the petition and answer. The answer is similar to the answer in the other cases.

Commissioner Russell. We will print the petition and the answer, if you please.

To the Honorable the Justices of the Superior Court, within and for the County of Middlesex:—

Respectfully represent your petitioners Marshall P. Wilder, Ezra Farnsworth, William H. Wilder, all of Boston, in the County of Suffolk and Commonwealth of Massachusetts; Benjamin Phipps, Jr., of Chelsea, in said County of Suffolk; Samuel B. Rindge and William H. Sherman, both of Cambridge, in said County of Middlesex; and John Byers and Ezra Farnsworth, Jr., both of the city, county and State of New York, doing business as copartners under the firm name of Parker, Wilder & Company; that the said Marshall P. Wilder, Ezra Farnsworth, Samuel B. Rindge, William H. Wi'der, Benjamin Phipps, Jr., and John Byers were on the eighth day of April, A.D. 1872, associated together as copartners under the firm name of Parker, Wilder & Company, and so continued until the first day of June, A.D. 1873, and during that time were the owners of the unexpired residue of a term of fifty years, ending on the first day of January, A.D. 1915 (renewable at their pleasure as hereinafter set forth), of and in the real estate and right, privilege and easement to take water hereinafter described. And on said first day of June, A.D. 1873, they associated with

themselves as copartners under said firm name, said Ezra Farnsworth, Jr., and said William H. Sherman, and that said Ezra Farnsworth, Jr., and W. H. Sherman, at the same time, became jointly and equally interested with the other petitioners above named, in said term of years and right, privilege and easement to take water, and that ever since said first day of June, A.D. 1873, your petitioners have been and now are the owners of the unexpired residue of said term of fifty years [renewable at the pleasure of your petitioners, at a rent not exceeding six per cent. on the apprised value of the said real estate and water right, not including buildings, structures or improvements, made after the ninth day of July, A.D. 1864, of and in a certain parcel of land situated in said Lowell, near the Concord river and upon both sides of Rivermeadow Brook, near the mouth of the same and thus described, viz.: Beginning at the northwesterly corner of the premises at a stake in the ground thirty feet easterly from the northeasterly corner of land of Smith, Meadowcroft and Sherman, in the range of their northerly line, said point being upon the southerly side of a street running from Lawrence street along the northerly line of their land; thence southeasterly ninety-two feet, at a right angle with said street; thence at a right angle northeasterly, ten feet; thence at a right angle southeasterly, one hundred and thirty feet; thence at a right angle northeasterly, forty feet; thence at a right angle southeasterly, fifty feet; thence at a right angle northeasterly, one hundred feet; thence at a right angle northwesterly, fifteen feet; thence at an angle of about seventy-five degrees westerly, one hundred and four feet; thence at a right angle northerly, eighty-seven feet; thence at an angle of about one hundred and thirty-one degrees northwesterly, ninety-two feet; thence at an angle of about one hundred and fifty degrees westerly, seventy-seven feet; thence at an angle of about two hundred and twenty-eight degrees, thirty minutes northwesterly, ninety-six. feet to a street; thence on said street at an angle of about one hundred and seven degrees, one hundred and thirty-two feet to the point of beginning: containing fifty-five thousand four hundred and sixty square feet, more or less.

2. And your petitioners further represent that they have been and are owners for the same times upon the same terms, and in the same proportions and manner as hereinbefore set forth, as to said land, of an unexpired residue of a term of fifty years, renewable as aforesaid, of and in a valuable right, privilege and easement connected with the use of said land, to take water from the Concord river in said Commonwealth, through a canal now or formerly of Oliver M. Whipple, of said Lowell, lying southerly of your petitioners' said land, to an amount equal to, but not exceeding, thirty-six cubic feet per second, for eleven and one quarter hours per day for six days of the week, except when the water in said canal does not equal two hundred and eighty-eight cubic feet per second, during the time aforesaid, and then and at such times to an amount equal to, but not exceeding, one-eighth of the quantity of water in said canal, and the water in said canal has always equalled and would always equal, except in very unusual and rare instances,

two hundred and eighty-eight cubic feet per second, but for the taking, withdrawal, diversion and obstruction of the same hereinafter set forth.

3. And your petitioners further represent, that they now are and have been the owners, and in possession for the same time and in the same proportions hereinbefore set forth with regard to said real estate, of a large mill or factory situated upon said land, and containing a large number of sets of costly machinery, each adapted to, and used for, the manufacture of flannels, which said mill or factory, and sets of machinery were all erected at great cost, for the purpose of using the aforesaid right, privilege and easement to take water, and together with said term of years and property are wholly dependent for their value upon the said water, which your petitioners have the right to take, as aforesaid — by which alone

said mill or factory and machinery can be used.

4. And your petitioners further represent that Sudbury river, so called, in said Commonwealth, is one of the natural sources and tributaries of said Concord river, and the waters thereof are the principal means of supply of said Concord river and that the waters of said Sudbury river, when undisturbed and unobstructed, and left to their natural course and current, flow into said Concord river, above said land and mill or factory of your petitioners, and with the waters of said Concord river, have been accustomed to, and of right ought to, flow through the canal aforesaid, and to pass by and through the said land and mill or factory, and furnish the waterpower on which said mill or factory and machinery are dependent for their use and value as aforesaid. And your petitioners are entitled to have their said share, viz., thirty-six cubic feet per second, of the water in said canal, undiminished and unabated. And your petitioners, if deprived of the right to the waters of said Sudbury river, flowing as aforesaid, would lose substantially the whole of their said right, privilege and easement in the waters of the said Concord river and in said canal, and the value of their said property, term of years, mill or factory, and machinery, would be greatly reduced.

5. And your petitioners further represent that under, by virtue of, in accordance with, and for the purposes of an act of the Legislature of the Commonwealth of Massachusetts, passed on the eighth day of April, A.D. 1872, entitled "An act to authorize the City of Boston to obtain an additional supply of pure water," and by and through the agency ordained by said act, the City of Boston, in the County of Suffolk, in said Commonwealth, within three years last past, previous to the filing of this petition, has taken all the water of said Sudbury river, at and above the dam built by the City of Boston in 1872, five hundred feet, more or less, below the crossing of the said Sudbury river, by the Boston, Clinton & Fitchburg Railroad, in the town of Framingham in the County of Middlesex, and near the brook which is the outlet from Farm pond into said river, and all the water in the said dam to the source or sources of said river; also all the water in Farm pond, so called, in said town of Framingham, and all the water in the brook connecting Farm pond with the Sudbury river; also all the water in all streams, brooks and rivulets, or water-courses of any kind, whether natural or artificial, that may flow into or from said Farm pond, and into or from said Sudbury river, at any point or points above said dam; subject to the restrictions set forth in Section 4 of Chapter 177 of the Laws of 1872, with reference to said water. To have and to hold the said waters to the said City of Boston, and its successors and assigns, to its and their sole use and behoof, agreeably to the provisions of the said act of the year eighteen hundred and seventy-two. And the said city has taken the whole right, title and interest in said waters, and has become the sole and absolute owner of the same, subject to the restrictions aforesaid. And by and as a part of the aforesaid taking, the said city has taken and your petitioners have been deprived of substantially the whole of their said right, privilege and easement, to take water from said Concord river, and the value of their said property, term of years, mill or factory, and machinery has been greatly reduced.

6. And your petitioners further say that said City of Boston by the authority and agency, and for the purposes hereinbefore set forth, and within three years last past, from the day of the date of this petition, has first actually withdrawn, diverted and obstructed, and has ever since continued, and still continues and intends henceforth to withdraw, divert and obstruct the waters of said Sudbury river, and said other waters in the fifth paragraph of this petition described, from and in what has always been heretofore, and what would have always been hereafter, their natural and accustomed flow into and through said Concord river, and by, through and over the aforesaid land, and mill or factory of your petitioners. All of which past, present and intended withdrawals, diversions and obstructions are against the rights of your petitioners, and have deprived and will henceforth deprive your petitioners of the water-power to which they are entitled as aforesaid, and have greatly diminished, and will henceforth greatly diminish or destroy, the value of your petitioners' rights in the same, and in said property, term of years, mill or factory, or machinery.

7. And your petitioners further represent that by reason of said taking of the waters of said Sudbury river, and the other waters aforesaid, and by reason of said past, present and intended, withdrawals, diversions and obstructions; and by reason of all the acts, matters and things of said City of Boston and its agents hereinbefore set forth, your petitioners have suffered great damage in their property, and that they have not agreed and have not been able to agree with the said City of Boston, upon the damages to be paid therefor, and that said city has not offered to pay them as

such damages any sum whatever.

Wherefore, your petitioners (not waiving any right to take advantage by petition for a writ of certiorari or otherwise, of the great and manifold errors and irregularities in the aforesaid acts and proceedings, but expressly reserving the right so to do), pray for the assessment of the damages by it sustained as aforesaid, and for such other relief as your petitioner may be entitled to have

in this court, and for a summons to said City of Boston conformably to the statutes in such case made and provided.

MARSHALL P. WILDER, SAMUEL B. RINDGE, WILLIAM H. SHERMHN, JOHN BYERS, EZRA FARNSWORTH, JR. EZRA FARNSWORTH, BENJ. PHIPPS, JR. WM. H. WILDER,

By their Attorney, O. W. HOLMES, JR.

SHATTUCK, HOLMES & MONROE, Attorneys and of Counsel.

COMMONWEALTH OF MASSACHUSETTS.

Middlesex, ss.

MARSHALL P. WILDER ET ALS., PETITIONERS FOR DAMAGES AGAINST THE CITY OF BOSTON.

1. And now come said City of Boston, and for answer to the allegations of said petitioners say, that they admit it to be true, as therein averred, that the petitioners were in possession of the land therein described at the times therein set forth; but said defendants deny that the petitioners were the lawful owners of the water-power therein described, and require them to make such proof, as they are advised, of the ownership of such water-power on the Concord river.

2. And the defendants, further answering, admit that the Sudbury river is one of the branches and tributaries of said Concord river, and the waters thereof, and the streams running into the same would naturally flow into said Concord river, and flow into and make a part of a head of water raised by a dam at Lowell, as

set forth in said Wilder, and others' petition.

3. The defendants, further answering, aver that said Wilder, et als., do not own any rights in said water-power, except it may be certain indefinite rights in common with other parties who have suffered damages jointly with them, if any, by the alleged taking, or any taking of the water of Sudbury river by the City of Boston, and the defendants claim that this petition for damages for the taking of the water of Sudbury river by said Boston, under and by virtue of the act of the Legislature, as set out in the petition, should have been brought by the petitioners jointly with the Wamesit Power Company, the Lowell Bleachery, Samuel N. Woods, Jonathan Hope, Robert H. Butcher, James Minter, the Belvidere Woollen Manufacturing Company, C. B. Snyder, Luther W. Faulkner, and others to the defendants unknown, who claim to own rights in said water-power, subject to certain rights, reservations and conditions therein, who are all jointly owners, or jointly interested in common, and not in severalty in said water-power with

said petitioners; and said petition of said Wilder, et als., if it may be sustained at all, should be jointly with the other owners, in common of said waters and water-power, who claim damages against city, because of the taking of said water, and not severally by each, because the defendants say that the water-power of said Concord river, at said Lowell, being undivided, it would be exceedingly burdensome and expensive to said defendants to be called upon to divide and show how the taking of said water of Sudbury river would affect the owners and claimants of the water severally, so as to protect themselves against the several claims of each owner therein. And they therefore pray the Court that this petition may be dismissed for non-joinder of the other owners of said waterpower, or that all the owners of any rights in said water-power, created by said dam at said Lowell, may be ordered to come in and join as parties in said petition, so that there shall be but one assessment of damages for one act of taking by said city of said water, and for a joint injury thereby to said water-power owned by the parties aforesaid at said Lowell.

4. And the defendants, further answering, deny that they have taken and diverted and withdrawn any of the waters of Sudbury river before the filing of said petition under the authority conferred by said act, set forth in said petition, in the manner and form therein set forth, or otherwise by said city acting under and by

virtue of the authority of said act.

And the defendants, further answering, say that said petitioners, and the owners of said water-power at said Lowell, on the Concord river, are not, and will not be damnified by the taking of the water of Sudbury river under said act, nor do they have any right therein or thereto, because they say that by the act of the General Court of Massachusetts, passed June 22, 1793, to which, with the acts additional thereto, the defendants beg leave to refer as part of their answer, certain persons therein named were incorporated by the name of the Proprietors of the Middlesex Canal, as a perpetual corporation for the sole object of uniting the waters of the Merrimack river in said Middlesex county, with the waters of the Medford river and Charles river in said county, by cutting a canal for that purpose, "provided that whereas it may be necessary in the prosecution of the foregoing business that the property of private persons may, as in the case of highways, be appropriated to public use."

It was also enacted therein that in the case where any person shall be damaged in his property by said proprietors in any manner, if said proprietors do not make or tender reasonable satisfaction to the acceptance of the person damaged by them, such person may apply within one year for a committee to estimate the damages so done, and such proceedings shall be had, that a committee should be appointed to estimate the damages and make return thereof to the next Court of General Sessions of the Peace, and that execution should issue thereon with a right of appeal to a jury for an

increase of said damages.

And the jury or committee, as the case might be, were empowered to give either a sum in gross for damages, or annual damages

during the continuance of said damage, and when the party injured

was to have judgment and execution thereof.

And it was also further enacted that the proprietors were authorized and empowered to purchase and hold to themselves and their successors forever, so much land and real estate as may be necessary for the purpose aforesaid, not exceeding the value of five thousand pounds; "provided that no water-course shall be turned or altered, where any mill is erected, so as to injure such mill, without license therefor first had and obtained from the General Sessions of the Peace in the county through which said water-course may pass. And that the said Court, on application made to it by said proprietors, shall observe the same rules as are now prescribed by law when application is made to them for granting a public highway."

And the defendants further say that by an act in addition to the act above referred to, passed on the 28th day of February in the year 1795, it was enacted that "the property of said proprietors in said canal, and in any other canal connected therewith which they shall effect pursuant to the authority of the government, and all real estate of said corporation of which the said corporation shall be seized, shall be divided into eight hundred shares," which were to be personal property for certain purposes only; and it was further therein enacted by the second section of said act "that said corporation shall have power to receive and hold real estate as appendant to said canal, and for the purpose of facilitating its business, to the sum of £30,000, over and above the value of the canal itself, simply considered;" and they were further empowered to make the waters of the Concord river boatable as far as Sudbury causeway, and as much further as the same can be usefully improved for that end; and to open any canal in any place in said County of Middlesex that may be necessary to connect the Concord river with said Middlesex Canal for that purpose, and that the proprietors shall be liable to have damages recovered against them by any individual who shall be injured or damnified in his property in such new canal, by the same mode of process and in the same manner as is in the same act provided.

And said defendants, further answering, say that, under said act of incorporation, surveys being made, it was found impossible, without great and inordinate expense, to take the waters of the Merrimack river through a canal to unite with the waters of the Medford river near said Boston, because it appeared that the waters of said Merrimack river, at a point where they were to come into said canal, were some twenty or more feet lower than the waters of the Concord river at said Billerica, at the point where said canal

must pass the same.

And the defendants, further answering, say, that by an act, in addition to the several acts respecting the proprietors of the Middlesex Canal, passed June 25, 1798, it appears that "whereas by an act passed February 28th, 1795, it is provided and enacted that the corporation of the said Middlesex Canal shall be empowered to hold real estate, as appendant to said canal, for the purpose of facilitating the business of the same to the value of 30,000 pounds over and above the value of the canal itself. And the proprietors

of said canal, having expressed their doubts whether in virtue of said act they may erect and hold mills on the same canal, and on the waters with which it is or shall be connected; it is enacted that the corporation of the Middlesex Canal, or the proprietors of said canal, in their corporate capacity, shall be empowered to purchase and hold any mill scats on the waters connected with the same canal, and lands to accommodate the same, and thereon to erect mills."

And the defendants, further answering, say, that by an act, in addition to the several acts passed respecting the Middlesex Canal, passed January 26, 1800, it is recited "that the proprietors of the canal have in their petition set forth that from a reservation in the acts already passed in their favor, the government has a right to regulate the toll of goods carried on the canal anew after the expiration of forty years, from which provision great discouragements and embarrassments have resulted in the execution of that project; therefore be it enacted that a toll of one-sixteenth part of a dollar for each ton carried one mile on the same canal be established for said proprietors and their successors forever."

And that afterwards, by an act, in further addition to the acts incorporating the proprietors of the Middlesex Canal, passed March 2, 1803, said proprietors were allowed the term of three years from and after the 22d day of June the next, to complete the same canal to Charles river, and to effectuate means of communication between said canal and the town of Boston across said Charles river by boats, and were allowed the further term of six years to render Concord river boatable and navigable, and for cutting their canals

in the County of Middlesex.

And the defendants, further answering, say that in 1798, after the passage of said act of that year, the proprietors of the Middlesex canal purchased said mill privileges on the Concord river at Billerica, and erected a dam for the purpose of raising a head of water to supply their canal, using the surplus to operate their mills, the grist-mill formerly on said stream having the first right; that in 1804 they completed their canal from Merrimack river to Charles river, and opened it for public navigation, taking toll therefor, using the head of water so raised in Concord river to feed their canal, and the surplus, whenever any there was, to run their said mills.

And the defendants, further answering, say, that in 1826, finding their dam insufficient to raise the water for their purposes, said proprietors built a new and more permanent dam in connection with the old one, which is the dam now maintained by said Faulkner and others, the petitioners for damages against said eity.

And the defendants, further answering, say that from the year 1804 down to the year 1851, the proprietors carried on their canal, using in the dry seasons of the year all the water of the river for keeping up the navigation on their canal, and the surplus for their own mills, the canal retaining the first right thereto, and said proprietors claim to hold and have the right to use all the water of said Concord river for the purposes of navigation, and the rights of the pubic therein until the same may be lawfully discontinued; and

that afterwards they applied for leave to wind up their affairs to the Supreme Judicial Court sitting in and for the County of Suffolk, which leave was refused and their petition dismissed, and said corporation still exists and holds all said water for a public use.

And the defendants, further answering, say that all the water of the Concord river, including that of Sudbury river, was taken, held and appropriated forever for a public use; to wit, to be diverted from said Concord river, and was so diverted into Charles river, and into Merrimack river, to furnish means of navigation in a public canal, opening above said dam at Lowell, to wit, at Billerica, and that damages were paid for such public use of said water, to all persons having any right therein, and injured by such diversion, and especially to those under whom the petitioners claim.

And the defendants, further answering, say that the proprietors of said Middlesex Canal had not, under their charter and the several acts in addition thereto, any right or power to sell or convey or assign any right to any person whomsoever, to use said water as against any other public use of the same, which taking of said

water by the City of Boston is for a public use.

And said defendants, further answering, say that said water of the Concord river was, in the manner and for the purposes and use aforesaid, and by the proprietors of said canal, taken, used and diverted from the Concord river during the greater part of the year, and especially in the dry season thereof (when alone said petitioners would or could suffer any loss or damage by the taking of the waters of Sudbury river), at Billerica, into said canal to Charles and Merrimack river, the said Concord river being used at said Billerica, which is a point four miles above the dam at said Lowell, as a feeder to said canal. And that the quantity of water so taken and diverted was at all times much greater than the whole natural flow of water received into said Concord river from said Sudbury river.

And that those under whom said petitioners claim to hold said water-power received compensation for all damages sustained to said mill-privileges and dam and water-power at said Lowell by reason of the taking and diversion of said water for public use; and the petitioners are not entitled again to receive damages for any diversion of said water for any other public use.

Wherefore the defendants ask to be dismissed of this petition, and go thereof without day, and for their reasonable costs in this

behalf sustained.

BENJAMIN F. BUTLER, Attorney and of Council for the City of Boston.

Mr. Shattuck. The original grant to the party who holds the reversion, or whose representatives hold the reversion, is contained in a deed made by Oliver M. Whipple, of Lowell, to Joshua Mather, dated the 18th day of May, 1857. These rights must depend upon the paper titles, because they have not been used for twenty years, and therefore in the trial we shall proceed upon the strength of

the paper titles. I say this, because if the matter is gone into, it will appear that some mill-owners have their flumes lower than others, and probably get, some of them, an undue proportion of the water. Some of them, for instance, the Bolt Company, and some other mills have their flumes higher, and some of them have them lower.

Mr. Butler. Yours is the lowest of all.

Mr. Shattuck. I believe the Sterling mill is the lowest of all.

Mr. Butler. The Sterling mill flume is so arranged that you can draw longer than anybody else. That is the exact

condition of things.

Mr. Shattuck. But, as I say, they all depend upon the paper titles now, and of course they may be adjusted at any time until rights have been acquired by adverse use by the parties. We must proceed of course and prove the title, and all of these mills upon the Wamesit dam, depend upon a grant which, I believe, is in the same terms, and which I will now read:—

Know all men by these Presents, that I, Oliver M. Whipple, of Lowell, in the County of Middlesex, and Commonwealth of Massachusetts, in consideration of fifteen thousand dollars to me paid by Joshua Mather, of the same Lowell, the receipt of which sum is hereby acknowledged, do hereby give, grant, bargain, sell, and convey unto the said Joshua Mather a certain parcel of land situate in said Lowell, near the Concord river, and upon both sides of River Meadow brook, near the mouth of the same, and thus described, viz.:—

Beginning at the northwesterly corner of the premises, at a stake in the ground thirty feet easterly from the northeasterly corner of land of Smith, Meadowcroft and Sherman, in the range of their northerly line, said point being upon the southerly side of a street running from Lawrence street along the northerly line of their land, thence southeasterly ninety-two feet at a right angle with said street, thence at a right angle northeasterly ten feet, thence at a right angle southeasterly one hundred and thirty feet, thence at a right angle northeasterly forty feet, thence at a right angle southeasterly fifty feet, thence at a right angle northeasterly one hundred feet, thence at a right angle northwesterly fifteen feet, thence at an angle of about 75° westerly one hundred and four feet, thence at a right angle northerly eighty-seven feet, thence at an angle of about 131° northwesterly ninety-two feet, thence at an angle of about 150° westerly seventy-seven feet, thence at an angle of about 228° 30' northwesterly ninety-six feet to a street, thence on said street at an angle of about 107° one hundred and thirty-two feet to the point of beginning, containing fifty-five thousand four hundred and sixty square feet, more or less. Also, the right, privilege, and easement to take water by means of the canal of the grantor, lying southerly of the premises, and leadDEED. 547

ing out of the Concord river, and by means of head race-ways to enter the said canal at any point opposite the premises, and to conduct the water to the premises, to be used thereon, the same to be done in such a manner as in no wise to injure or weaken the banks of said canal, or interrupt the flow of water therein. Also, the right for said water to enter said canal from the said Concord river to the extent hereinafter specified, and the right forever hereafter to have said canal and the banks thereof and the permanent dam owned by the grantor across Concord river continued for the purpose of affording a water-power, and to the extent and with the exceptions and reservations hereinafter contained and set forth, the quantity of water which may be drawn from the canal by grantee, his heirs and assigns, is strictly limited to, and shall not exceed, thirty-six cubic feet per second for eleven and one-quarter hours per day of six days of the week, and if at any time the quantity of water in the canal shall not equal two hundred and eighty-eight cubic feet per second during the time aforesaid, then the grantee, his heirs and assigns, shall during such time be restricted to one-eighth of the quantity of the water in the canal; meaning that the quantity of water which may be drawn from the canal by the grantee, his heirs or assigns, shall never at any time exceed thirty-six cubic feet per second for the above specified time, however great may be the supply of water from the said canal, and that the quantity of water which may be taken by the grantee, his heirs and assigns, shall be restricted to such an amount less than thirty-six cubic feet per second during the above specified time, as shall be equal to one-eighth of the supply afforded from the canal, whenever the water in the canal shall be less than two hundred and eighty-eight cubic feet per second for eleven and one-quarter hours per day for six days of the week.

Also, a right to pass with cars over the railroad leading from the Boston & Lowell and Lawrence Railroad, at Whipple's station, to the above-described premises, and over the premises of the grantor, as the railroad is now constructed, or as it may be constructed hereafter, by the grantor or by the proprietors of the several rights or grants now made, or which may be made by the grantor, his heirs or assigns. But this right is to be used in common with other grants made by the grantor, or which may be made, and in common with the grantor, his heirs and assigns; nor shall he or they be under any obligations to maintain said railroad or to extend the same; meaning only to grant the right to use in common with others, the present railroad track, so long as the same may continue, with a right of rebuilding a track and using and maintaining the same as aforesaid, and subject to the rights of the Boston & Lowell Railroad, Lowell & Lawrence, and Salem & Lowell Railroad Companies, and subject to such changes in the direction or situation of the track as the grantor, his heirs or assigns, may reasonably demand; and in case said railroad shall be discontinued, the grantee, his heirs and assigns, shall have, so long as the railroad shall be discontinued, a right of way to pass and repass with teams from Lawrence street to the conveyed

premises, over the space between the conveyed premises and the canal, but so as not to obstruct said space to the injury of the

grantor, his heirs or assigns.

And the grantor, for himself, his heirs and assigns, covenants with the grantee, his heirs, that he will within seven months from this date so enlarge the said canal that the same shall be of sufficient capacity at all times when the water in the river and canal is as high as the top of the said permanent dam in Concord river, to carry and discharge not less than two hundred and eighty-eight cubic feet per second of eleven and one-quarter hours per day of six days of the week, without the water therein at the head of the head race-ways of the grantee being drawn down more than six inches below the top of said permanent dam. And the said Whipple, for himself, his heirs and assigns, further covenants that he will forever hereafter keep and maintain in suitable and proper condition and repair, the said canal, enlarged to the capacity aforesaid, and the banks and parts and appurtenances thereof. Also the said permanent dam and the eight-inch flash-boards as they are usually kept thereon, subject to such reasonable and temporary interruptions and hindrances as may be necessary in such maintenance and repairs.

This deed is on the express reservation to the grantor, his heirs and assigns, of the annual sum of fifteen dollars, to be forever hereafter yielded and paid by the grantee, his heirs and assigns, for such maintenance and repairs. And this deed is also on the express condition that for affording reasonable facilities for measuring water taken from the canal by the grantee, his heirs or assigns, the head race-way of the grantee shall consist in whole or in part of a flume or flumes which shall not be less than fifteen feet in length, with the sides and bottom smooth. grantor, his heirs and assigns, may at any and all times hereafter enter upon the said premises of the grantor and make such admeasurements as may be requisite and proper for determining the quantity of water taken. To have and to hold the said conveyed premises with the privileges and appurtenances belonging to the grantee, his heirs and assigns in fee simple forever. And I, the grantor, for myself, my heirs, executors, and administrators, do covenant with the grantee, his heirs and assigns, that I am lawfully seized in fee simple of the aforegranted premises, that they are free from all incumbrances except a mortgage given by me, on the premises, with other parcels of land, to the City Institution for Savings, which mortgage I am to pay, and against the same to indemnify and save harmless the grantee, his heirs and assigns; that I have good right to sell and convey the same to the grantee, his heirs and assigns, forever as aforesaid, and that I will, and my heirs, executors, and administrators shall, warrant and defend the same to the grantee, his heirs and assigns, forever against the lawful claims and demands of all persons.

In witness whereof we, the said Oliver M. Whipple and Sarah K., his wife, in token or her release of all claim of dower in the premises, and who, for the consideration aforesaid, and in consideration of one dollar to her paid by said Mather, joins herein and

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releases and conveys with said Whipple to said Mather, his heirs and assigns, all right and title to and of homestead exemption in the premises herein described as aforesaid, have hereunto set our hands and seals this eighteenth day of May, in the year eighteen hundred and fifty-seven.

Attested and delivered in presence of E. B. Patch to O. M. W. Henry J. P. Whipple to S. K. W. Oliver M. Whipple (L. S.)

Sarah K. Whipple (L. S.)

Commonwealth of Massachusetts, Middlesex, ss. May 21, 1857. Then personally appeared the above-named Oliver M. Whipple and acknowledged the foregoing instrument to be his free act and deed. Before me,

E. B. PATCH,

Justice of the Peace.

Middlesex, ss., North District. Received and recorded May 21, 1857.

A. B. WRIGHT,

Register.

Middlesex, ss., North District, Registry of Deeds, March 8, 1876. I hereby certify the above to be a true copy of the record of deed recorded in book 9, page 475.

Attest: J. P. THOMPSON,

Register.

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This was leased first by Joshua Mather to Charles A. Stott, of Lowell, on the 9th day of July, 1864, and he demises the property described in that deed (the deed dated the 18th day of May, 1857), with all the appurtenances, and everything else, for fifty years, from the first day of January, 1865.

This Indenture, made and entered into this ninth day of July, in the year of our Lord one thousand eight hundred and sixtyfour, by and between Joshua Mather, of Lowell, in the County of Middlesex and Commonwealth of Massachusetts, party of the first part, and Charles A. Stott, of said Lowell, party of the second part, witnesseth: That the said Mather doth hereby lease, demise and let unto the said Stott all the real estate, land, millprivilege and water-power in said Lowell, described in and conveyed and granted by a deed given by Oliver M. Whipple, of said Lowell, to said Mather, bearing date the eighteenth day of May, in the year of our Lord one thousand eight hundred and fiftyseven, and recorded in the Registry of Deeds in and for the Northern District of Middlesex County aforesaid, in Book nine (9), page four hundred and seventy-five (475), with, and including, all the appurtenances, rights, privileges, easements and advantages thereto appertaining or belonging, and subject to all the qualifications, reservations, restrictions, requirements and conditions, subject to which the same were conveyed and granted by said deed to said Mather, or are, or have been, held by said Mather under said deed (reference to said deed and the record thereof, as aforesaid, being had for an accurate and full description of the

premises hereby leased, demised and let.)

To hold, subject to the conditions, reservations and restrictions hereinafter stated, for the term of fifty years from the first day of January, in the year of our Lord one thousand eight hundred and sixty-five, and ending on the first day of January, in the year of our Lord one thousand nine hundred and fifteen, yielding and paying therefor the annual rent of one thousand and four hundred dollars for every year in said term, in semi-annual payments of seven hundred dollars each, on the first day of July and the first day of January at the end of every six months in each year in said term, and also paying all taxes and assessments whatsoever which shall be assessed, levied, or in any way made upon said leased premises during said term, and also paying all taxes and assessments which shall be assessed, levied, or in any way made upon said rent in said Commonwealth of Massachusetts, under authority of the laws thereof, during said term, whether as state, county, city or town, or other taxes or assessments, meaning that said lessee and those having his estate in said leased premises are to pay all taxes and assessments assessed, levied, or in any way made upon said leased premises during said term; and also all taxes and assessments assessed, levied or made upon said rent, during said term, whether assessed to said Mather and those having his estate in said leased premises, or to the said lessee and those having his estate in said leased premises, excepting the United States income tax, and any taxes and assessments assessed, levied or made upon said rent in other states or territories or foreign countries under the laws thereof, in case of said Mather, or those having his estate in said leased premises, residing, dwelling, or being in any other State, territory or foreign country.

And said Stott doth hereby covenant and agree with said Mather to pay said rent, as aforesaid, during said term, and also to pay, seasonably, all the taxes and assessments hereinbefore stated to be paid, as so hereinbefore stated, and not to suffer said leased premises to be sold for or by reason of non-payment of any taxes or assessments thereon during said term, or to be lost to the said lessor, or those having his estate therein, by reason of the non-payment of any taxes or assessments thereon during said term; and to perform, fulfil and keep any and all the condition and conditions contained in said deed from said Whipple to said Mather, and not to suffer said leased premises to be lost to said Mather, or those having his estate therein, by reason of the nonperformance, non-fulfilment or the not keeping of any condition or conditions contained in said deed from said Whipple to said Mather; and to erect on said premises a mill or factory for manufacturing; and to keep the buildings which shall be erected on said premises insured by some safe insurance company or companies of good repute, and to apply the amounts of money which shall be received by virtue of such insurance, or so much thereof Lease. 551

as shall be needed to the restoration and repair of the buildings on said premises as soon as reasonably can be done after the

destruction or injury thereof by fire.

But this lease and indenture are made upon the express condition that the same shall be void, and said term shall end, cease, terminate and determine, and be ended, terminated and determined upon said Stott, or those having his estate under this lease in said premises, failing to keep, perform and fulfil any of his covenants aforesaid, after request and notice to so keep, perform and fulfil from said Mather, or those having his estate in said leased premises; and that then said Mather, or those having his estate in said premises, shall have the right to enter into or upon said premises, and possess and hold the same as of his former estate, or to recover the same at law.

And the said Mather, for himself, his heirs, executors, administrators and assigns, hereby covenants with said Stott, his executors, administrators and assigns, and those having his estate in said premises, that in case said Stott, his executors, administrators and assigns, and those having his estate in said premises, shall keep, perform and fulfil all the covenants and agreements herein contained on his and their part, to be kept and performed and fulfilled during the term of fifty years aforesaid, then he, the said Mather, will, and his heirs and assigns, or those having his estate in said premises, shall, at the end of said term of fifty years, upon request of said Stott, his executors, administrators or assigns, and a compliance on his or their part, as the case may be, with the terms and conditions hereinafter stated, grant to said Stott, his executors, administrators or assigns a further lease of said premises for the term of fifty years from the end of said first term, hereby made and granted, by a lease and indenture in all respects like unto and the same as this, and with the same covenants, provisions and conditions as applied to the parties thereto, and the said premises as in this, except the changing of the names and descriptions of the parties thereto from those herein as may be required, and also, except as hereinafter stated. If, when said new and further lease is given, either of the two parties then holding and owning the interests of, and representing the said Mather and the said Stott under this lease, shall require or request a new valuation of said premises, then the said parties shall each choose one person, who shall be a well-qualified and experienced manufacturer, and also a superintendent of, or owner in, one of the principal or large manufacturing establishments in said Lowell, and they two so chosen shall choose a like third person, and the three so chosen shall, under oath, appraise the then value of said premises as hereby leased (the real estate, land, mill-privilege and water-power, but not including buildings, structures or improvements hereafter made); and if six per cent. interest for one year on the sum at which the same shall be so appraised shall be greater or less than fourteen hundred dollars, then the annual rent for said further or second term shall be fixed or ascertained by taking fourteen hundred dollars, and adding thereto such excess, if any, or substracting therefrom such lack or deficiency, if any,

and the sum or remainder, as the case may be, to be the amount of annual rent to be paid in said new lease or further lease, instead of fourteen hundred dollars as in this, but fourteen hundred dollars to be the annual rent in said new lease, if neither party shall require or request a new valuation, as aforesaid, or if said sum of fourteen hundred dollars shall not be increased or diminished by the proceedings and process aforesaid. of said new or further lease or indenture are to be interchangeably signed, sealed and delivered by the parties thereto on both parts in the same way and manner as the two parts of this have been; and the expenses of such new and further lease or indenture, and of the appraisal, as aforesaid, and the attendant expenses are to be borne equally by the two parties to said new or further lease, each party paying, and to pay one-half thereof. It is understood that there is to be in such new or further lease or indenture a clause or covenant for renewals, as in this lease or indenture, subject to the same terms and conditions and to the like change of names and descriptions of parties, and to the same right to have an appraisal or new valuation, with a consequent increase or decrease of rent in the next lease, and subject to be defeated by the termination of the term or forfeiture or ceasing thereof in said new or further lease, as in this, and by the same way and means, and that renewals may be required one after another every fifty years, indefinitely, by like lease and changes and new valuation and consequent change of rent, if new valuation required or requested, unless such right to renewal is defeated, forfeited or waived, as it may always hereafter be, under whatever lease in the same way and manner as it is provided, it may be in this lease, during the continuance or at the end of the term of fifty vears.

I, Mary J. Mather, wife of said Joshua Mather, join herein to

release dower in said leased premises.

In witness whereof, the parties aforesaid have hereunto interchangeably set their hands and seals, the day, month and year hereinfirst written.

> JOSHUA MATHER, CHARLES A. STOTT, MARY J. MATHER.

Signed, sealed and delivered in the presence of us. The words "any," "stated," and "is provided it," being first interlined, and the word "said" in one place, and the word "be," in one place, erased.

HORATIO G. F. CORLISS, witness to Joshua Mather, John Stott, witness to C. A. Stott, Almira Smith, witness to M. J. Mather.

COMMONWEALTH OF MASSACHUSETTS.

MIDDLESEX, SS.

July 9, 1864.

Then the aforenamed Joshua Mather acknowledged the foregoing instrument to be his free act and deed.

Before me,

HORATIO G. F. CORLISS,

Justice of the Peace.

COMMONWEALTH OF MASSACHUSETTS.

LOWELL, July 14, 1864.

Recorded in the Registry of Deeds for the Northern District of Middlesex, in Book 39, page 468.

A. B. WRIGHT, Registrar.

That, by an assignment by Charles A. Stott, dated February 1, 1871, was transferred to Parker, Wilder & Co., who are the petitioners in this case.

Know all men by these Presents, that I, Charles A. Stott, of Lowell, in the county of Middlesex and Commonwealth of Massachusetts, lessee named in a certain lease given by Joshua Mather, late of said Lowell, deceased, to myself. dated July 9, 1864, and recorded in Middlesex North Registry of Deeds, in book 39, page 468, for and in consideration of the sum of thirty-five thousand dollars, to me paid by Marshal P. Wilder, of Boston, in the county of Suffolk and Commonwealth aforesaid; Ezra Farnsworth, of said Boston; Samuel B. Rindge, of Cambridge, in said county of Middlesex; William H. Wilder, of West Roxbury, in the county of Norfolk and Commonwealth aforesaid; Benjamin Phipps, Jr., of Chelsea, in said county of Suffolk; and John Byers, of the City of New York, in the State of New York, all partners in business, under the firm name and style of Parker, Wilder & Company, doing business at said Boston, at and before the sealing and delivery hereof, the receipt whereof I do hereby acknowledge, have granted, bargained and sold, assigned and set over, and by these presents do grant, bargain and sell, assign, and set over unto the said Marshal P. Wilder, Ezra Farnsworth, Samuel B. Rindge, William H. Wilder, Benjamin Phipps, Jr., and John Byers, their executors, administrators, and assigns, the above described lease, and every article, claim, covenant, provision and agreement therein contained, and the unexpired term of years thereby demised, and all right and claim to renewals of said lease, and for further leases of the premises; and all that messuage, tenement and tract of land in said lease demised, together with all the appurtenances, improvements, including the four-story brick mill and steam boiler, and all other fixtures of every description on the premises; and also all my estate, right, title, term of years yet to come, and demand whatsoever, of, in, to, or out of the estate.

To have and to hold the same to the said Marshal P. Wilder, Ezra Farnsworth, Samuel B. Rindge, William H. Wilder, Benjamin Phipps, Jr., and John Byers, their executors, administrators, and assigns, to their use and behoof forever, under and subject to the yearly rent in said lease reserved, and to the covenants and provisions therein contained

provisions therein contained.

In witness whereof I, the said Charles A. Stott, have hereunto set my hand and seal, this first day of February, A. D. 1871.

CHAS. A. STOTT.

Signed, sealed and delivered in presence of

COMMONWEALTH OF MASSACHUSETTS,

MIDDLESEX, SS., February 10, 1871.

Then personally appeared the above-named Charles A. Stott, and acknowledged the above instrument to be his free act and deed, before me,

JOHN F. McEVOY,

Justice of the Peace.

Mr. Butler. Is there any mortgage on these premises? Mr. Shattuck. No.

The first question to be considered in all these cases is, what does the city take; and some arguments have been made on the question whether the city takes and is to pay for the whole of the Sudbury river; and upon that question I should like to say a few words, and I may as well say them now. It is well known as a matter of tradition, or was at the time this act was passed, that when the city took the Cochituate water it was very difficult to show what the damages were. Of course there was only a limited amount of water taken at the outset, and it is impossible in any one season to determine what the effect of it has been. Take for example the case of the Essex Company; take three months of 1872 and compare them with three months of 1873, and if two-thirds of the water had been taken during three months of 1872 there would have been as much left as there was during the corresponding three months of 1873; so that investigations for a single year have very little significance in determining the amount of damages, and when the City of Boston proposed to take Sudbury river there were two plans suggested, in order that the rights of the mill-owners might be protected; one plan was that the city should be compelled to make compensating reservoirs, so that while taking a sufficient water supply for the city they could secure to the mill-owners below, substantially, all the beneficial use that they now have; but the working of the compensating reservoirs is very uncertain, more so I believe in this country than in England, and that theory was abandoned, and it was finally decided that in order that there might be a certainty as to what compensation the mill-owners were entitled to, that the city should take all the water in the Sudbury river, — all the water-rights in the Sudbury river, — and by the provisions of the act you will see that they are to pay, not simply damages for the taking of water, but for the taking of water-rights, and the rights that they acquire by the terms of the act are to take all the water of the Sudbury river. Now, nobody supposed that they would actually, in times of great freshets, at present or for a long period, take

and enjoy all the water running in the Sudbury river; but inasmuch as it was a question of great uncertainty how much they would take, and as it is, as this commission must now be aware, very difficult, at best, to determine the value of water-rights, the Legislature said to the City of Boston, "You must take this water, - these water-rights, - in the most definite form for the protection of the mill-owners; you must take all the water and pay for all the water, and then you can do what you please with it;" and these other provisions in the 4th section, for other towns, did not limit the grant; it was carefully worded so as not to limit the grant: "Nothing contained in this act shall be so construed as to authorize the City of Boston to reduce the water in Sudbury river below a sufficient height to maintain at all times a running stream therein." That was to avoid a public nuisance, having an empty stream, and also to furnish some scouring water for some of the mills for mechanical uses; and then they should not draw from Farm pond or Sudbury river into Lake Cochituate when the water runs over the dam at Lake Cochituate, but they may draw it in any other way, and it shall not "prevent the inhabitants of the towns of Framingham, Ashland, Southborough, Hudson, and Westborough from taking from the Sudbury or Assabet rivers or Farm pond so much of the water hereby granted as shall be necessary for extinguishing fires." The theory of this was that the city was to take all the water and pay for all the water; but to prevent a public nuisance, and for the protection of these towns, they took it with certain burdens, and the city agreed to these arrangements by accepting the act, and I never heard it suggested, until the ingenious and able argument made in this case, that there was any doubt that that was the construction. It was clearly intended, and it was intended, because the mill-owners said, "If you will put it in that way so as to make it certain, we will withdraw our opposition to the act."

Mr. Butler. Then what I understand your theory to be, is that the city is to pay for the one and one-half millions

of gallons they let run down?

Mr. Shattuck. My theory is, that the city is to pay for every drop of water in Sudbury river. And they took the whole of it; there was no limitation of their grant. It was known at the time that something would be allowed to flow in the river; it was known that they must allow some of it to flow in the river, and they put in the limitation in order to prevent a public nuisance. They take it all and dispose of it in various ways; some of it they sell to citizens, some of it they are required to permit other towns to take, and some

of it they are required to permit to run in the river; and if any one can take that act and construe it to mean something else, I certainly find it very difficult to see where the argument is found to support it. It will hardly be proper to refer to the history of it, although I was counsel, with some other parties who are here present, and recollect all about it.

Now, the next question, assuming that they took all the water of Sudbury river, as we have a limited right to a fractional part of 288 feet per second, it follows that if there is an amount of water running in the river in excess of 288 feet, so great that we can spare all the water of the Sudbury river, why then we suffer no damage. The maximum damage that we suffer, that is, our maximum loss of power, would occur if there were exactly 288 feet flowing all of the time in the Wamesit canal; we should then lose just one proportion of that.

Mr. Butler. And no more?

Mr. Shattuck. And no more. Just our proportion of that 288 feet. Of course, if the amount flowing was 300 feet per second, and they take away a percentage of it, and that percentage reduces it below 288 feet, then we lose a percentage of it, but a smaller amount than if the flow was exactly 288 feet; and we continue to lose something up to the time when the flow, if it ever was so great, was so large that after taking the whole Sudbury-river supply there were still 288 feet lett.

On the other hand, as the quantity in the river diminishes, falls below 288 feet per second, the amount of power that we lose is diminished until we come down to the minimum in the river, although the percentage of loss increases. course, if there were only 200 feet in the river and one-fourth is taken away, our actual loss of horse-power would be less than if there were 288 feet running in the river and the same proportion was taken. That makes it an important question for us to determine, what is the effective flow of the Concord river at the Wamesit dam; and that is the most important question, probably, that we have to deal with; and fortunately there are one or two pretty accurate tests which have been in existence for many years, which, we think, practically settles the question, and we find that those results are in harmony with the results obtained by such investigations as we have been able to make by measurements. First, below, or a short distance below, the Wamesit dam, is the Middlesex dam, and that has the same water supply, plus a small supply from the River Meadow brook, which is about five feet per second in a dry time. On that Middlesex dam the Middlesex Company have a right

to use certain breast-wheels and a fulling-mill, under a grant going back to 1822, which, by careful experiment and measurement, have been ascertained to call for not exceeding 168 feet per second. After that supply has been furnished, the Belvidere mill (we will call it the Stott mill for convenience, and we will call the one on the Wamesit dam the Belvidere, because, I believe, that is the way they are called in Lowell), the Stott mill is using $\frac{22}{35}$ of the surplus water, 19 under a grant and 3 under a lease at will; and they call, as we shall show, for 60 feet per second, and the other $\frac{3}{25}$; in round numbers, for 6 feet, or more, per second. Now, if you will add together the 168, — which I understand to be the maximum of the Middlesex supply in winter, when the fall is less than in summer, — add it to that 66, and you have 234 feet per second as the available supply of the Concord river; that is, the maximum supply which a prudent mill-owner could count upon in building a mill and putting in machinery. Of course, the minimum in dry times falls below that; the maximum is above it; but the power which the prudent mill-owner would count upon in putting in a mill, — that is, the available water as it has been used practically over the Wamesit dams and the other dams below, and that, I take it, is the test (I need add nothing to the argument made by brother Merwin), and the question here is, practically, what is the damage; and we shall show you that the Stott mill, which has this surplus, is obliged now to use steam from one to two months in the year, because it has not water enough with this machinery, which only calls for 60 feet per second. When we have shown that,—that it calls for the use of steam for one or two months in the year, and did before this water was taken by the city, — we show conclusively that it would not be worth while to put in a mill relying on water-power to use any surplus beyond that; therefore, as nearly as it is practicable, we do show that that 234 feet is the maximum supply of the Concord river.

Mr. Butler. I shall be very glad if you will, for then up goes Mr. Faulkner and Mr. Talbot higher than a kite.

Mr. Shattuck. We must take the results as we find them practically. Of course, many times in the year there is much more water than that; but that is all the water which is had with Hale's brook, as the water runs in Concord river, for the benefit of mills by the best measurements human ingenuity is capable of making. The water in the Concord river I need not say is probably more stable, that is, the supply is more even than the supply of any other river of its size in New England, in consequence of this vast reservoir above the Talbot dam; but still, even the Concord

river does not compare with the Merrimack for permanence and regularity of supply, and the smaller the river the more uncertain the supply, and that is well known. It is like a savings bank, - if you depend upon the contribution of a very small number, it will go very low down or very high up, and when you get in a vast number it makes an even contribution. Now take Hale's brook, and the lowest supply there is oneseventh of a foot per square mile; it has 24 square miles of drainage area, the minimum I mean, the lowest in the dryest time; probably the minimum on the Concord river is onethird of a foot per square mile; the minimum on the Merrimack is six-tenths of a foot per square mile, showing how the minimum is affected by a large increase in the surface drainage, the drainage area. I would also add now, that we shall refer to the testimony of Mr. Mills, who puts the minimum for one month in a year at below 200 feet per second in the Concord river; you recollect his testimony in the Essex Company's case, which is also confirmed by our measurements and estimates. The next piece of testimony that we shall put in concerning this case are measurements made by Mr. Frizell, of the water actually running in the Concord river for a month in August, which is this last month of August and September, and by comparing the amount running at that time with the rainfall at that time, and making the best estimate he, as an engineer, could make, he puts the effective flow in the Concord river before the taking, as the water runs and was used over the Wamesit dam, at 225 feet per second. He will state to you the reasons; it is not necessary for us to go into them. Of course it often goes up to 288 feet, but we shall show —

Commissioner Francis. Does this mean for the whole 24

hours?

Mr. Shattuck. No, sir; it means during the day, as it is used. It is not all used during the day, — they run some during the night; but I mean taking it as it is used during the $11\frac{1}{4}$ hours.

Mr. Butler. And what runs over the dam?

Mr. Shattuck. I mean it runs 225 feet per second during the 11½ hours as it now runs. He does not say it would not be more than 225 feet per second if it could be so arranged as to have all the water running during that time, but he takes it practically as it has been used, and that is the available flow. We shall also put in evidence to show how much of the time the water runs over the Wamesit dam all day. Now, there are many days when it will run over in the morning after the accumulations of the night; but, of course, if after the mills begin to run they draw it down so

that it does not run over, why, then, it indicates that there is less than the amount that is called for, — 228 feet, — and our theory is, that during nine months in the year there is not, substantially, over the 228 feet per second running. I mean

the average.

The next question that I come to is, What amount of this water running over the Wamesit dam does the Sudbury river furnish? The drainage area of the whole of the Concord river, — excluding, of course, Cochituate lake, which had been taken before, — down to the Wamesit dam, is 351 square miles.

Mr. Butler. Wait a moment; let us see if we cannot agree to those, and save all trouble. We will agree to that,

excluding Lake Cochituate.

Mr. Shattuck. Yes. Then the drainage area of the Sudbury river is as the city report makes it, and as their engineer makes it, as I understand it, $77\frac{8}{10}$. That is in the report which is put in by the city; — I had the book here this morning, but some one has taken it off. That is the report, — $77\frac{8}{10}$.

Mr. Butler. It was not made by Mr. Davis, the City

Engineer.

Mr. Shattuck. It is the report — part of the res gestal — of the measurements by the city, and is evidence.

Mr. Butler. As there is an error in it, we will allow you

to prove, I guess, that part of it.

Mr. Shattuck. I will prove it by putting in that statement which they made. Of course, if you will show it is a mistake, you are entitled to it.

Mr. Butler. I take it, if a man reports to me a thing

which is a fact, I am not bound to show it is a fact.

Mr. Shattuck. You are not bound by it, but it is evidence. The drainage area of the water-shed above the dam is reported here as $77\frac{8}{10}$.

Mr. Butler. I object; it is not a paper made by any

officer of the city.

Mr. Shattuck. It was a report made to the City of Boston, and an agent.

Mr. Butler. Will not you read the title-page? Mr. Shattuck. "History of the Boston Water Works, from 1868 to 1876, being a statement of the history of the introduction of pure water into the City of Boston, with a description of its Cochituate Water Works, et cetera, 1868." The part of it read from is a quotation in Mr. Bradlee's history, but he brought it down to 1868, and then some one else, the city itself, has brought it down to the present time, and they have reported that the drainage area of the water-shed above the dam —

Mr. Butler. I object.

Commissioner Russell. Now, Mr. Shattuck, what do

you offer?

Mr. Shattuck. I propose to offer the statement contained in this book under the head of the "Description of the works of the new water supply,"—a descriptive statement of that territory which the water is taken from, and of the drainage area, what is said about it.

Commissioner Russell. As proving the drainage area

of Sudbury river?

Mr. Shattuck. As having a tendency to show the drainage area of Sudbury river. Of course, an admission by an agent is not competent when made outside of his business, but when it is made as a part of the res gestal, a part of a transaction, as a part of his duty, that admission is binding upon the principal. Now, to apply that to the City of Boston; I have always considered it doubtful whether a report of a branch of the city council, of a legislative committee, if you may so describe it, is necessarily competent; but in this matter of the taking of water, the city stands in the same footing with an aqueduct corporation. The chairman will recollect a distinction that was taken in the case of Child vs. The City of Boston. A town would not be liable for neglecting to keep in repair and maintaining a highway, because it does that as a public officer, and is only liable when the liability is imposed by statute. There are certain duties performed by municipal corporations in which they stand in the same relation to the public that a private corporation does, and they are liable for any neglect of any agent in the performance of their relation to it. It was so held that they were liable for neglect in the maintenance of a common sewer, because that is one of the executive duties imposed on the city, and in relation to it they stand like any private corporation, and when the city, as they did take from the Jamaica-Pond Aqueduct Corporation the powers which it had, substantially, to furnish water to the city, and proceed to act under it in furnishing water to the city, they stand in the same position that any private corporation would stand, who was discharging the same duties, and if they send out an agent or employ agents to ascertain what the works are, what the property is that they propose to take, and in the performance of their duties they ascertain certain facts, and these facts are reported to the commissioners who represent the city, that report and those statements are competent evidence against

the city to show what they admit. Of course, if there is any error here, the city can correct it, but we only offer it as evidence tending to show what the measurements are.

Commissioner Russell. But you have not stated, Mr.

Shattuck, whose report you offer to show.

Mr. Shattuck. This is one of the reports of the Cochituate Water Board made to the —

Mr. Butler. Oh, no!

Mr. Shattuck. Is there any question that this was pub-

lished by the Cochituate Water Board?

Mr. Butler. It is published by the City Government, and if you will let me state, sir, I think there will be no question about this. It seems, it is too plain for argument, and my statement will be the best argument. By law the city has but one authorized agent to deal with its water, rights, and its water works, and that is the Cochituate Water Board, or the new board lished by law last winter; the water commissioners, and no other person or agent of the city has any right to make experiments or to say anything about it. That book is published by the City Government, for the information of the citizens; it is not a report of the Cochituate Water Board, which was in existence at the time this was prepared; it is a gratuitous work of a superintendent of one division of the work, who desired to carry on the history, and the city have published it; that is the character of the document. I do not know, as the difference is but slight, but what I should like to let it go in, for I suppose if it goes in as a declaration of the city, then all the declarations made at the same time must be put in as evidence, for them as well as against them, and I should get all there is of that history in evidence, and as the difference in the water-shed by any possible error is only four or five miles, it don't make much odds. Perhaps that would be the better rule, but we are now standing on the question of evidence.

Mr. Shattuck. Do I understand that you are willing to

have it go in?

Mr. Butler. Not yet. We are now standing on the question of evidence. That is the character of the work offered.

Commissioner Russell. I don't understand that the book is offered, and that is what I propose to ask Mr. Shattuck; whether he offers that book as a report made by one of the departments of the City of Boston to the city government of Boston. The whole book you offer?

Mr. Shattuck. No, I don't propose to offer the whole

book.

Commissioner Russell. Then I understand you propose to offer that extract from that book, and my difficulty is that I don't know what the authority is of that extract, — what it purports to be. I don't understand that what you offer purports to be the report of any official to any department of the city—

Mr. Shattuck. This shows exactly; I offer it as a report. It is a report of Desmond Fitzgerald, Superintendent of the Western Division of the Cochituate Water Works.

Commissioner Russell. Do you understand the whole of that is a report from Desmond Fitzgerald to the City Government?

Mr. Shattuck. The first part of it here is a supplement; the whole of it is in the nature of a report. It is a supple-

ment to Bradlee's history.

Commissioner Russell. If you offer the whole report, it is one question; if you offer a piece of that report, an extract, which may be the statement of Mr. Fitzgerald or the statement of anybody else, I cannot pass upon the admissibility of it without knowing what it is, what it purports to be, and by what authority it purports to come here. It may be an extract which states the opinion of somebody who has nothing to do with the city, and therefore I ask you to state what you propose to offer, whether it is the book itself, and if not, what extract you propose to offer?

Mr. Shattuck. This is rather an irregular way of determining whether the evidence is admissible on the opening.

Mr. Butler. If you don't offer it, then I have no ob-

jection.

Mr. Shattuck. It was not regular except that the objection was taken, and I therefore referred to the book because I have no particular objections to having the question considered now; but still perhaps I had better go on with my

opening. I withdraw it for the present.

The Sudbury river, we say, takes about 22 per cent. of the drainage area of the whole of the Concord, excluding Lake Cochituate, and the question is how much that takes from our supply at the Wamesit dam? It is conceded by the city, and stated in the testimony of Mr. Mills, that without the Sudbury river there was a sufficient amount flowing in the Concord river to supply the wastage and evaporation. It is hardly necessary to read that now, but it is in the testimony of Mr. Mills. Mr. Mills so testified, — page 90 of the report.

Mr. Butler. I will agree to Mr. Mills' statements, sir. Mr. Shattuck. I am simply going to read what his statement is: "I have no question but there is, after the taking

of this water from the upper Sudbury, sufficient water coming in to supply the evaporation, and for all wastage in the territory below, so that the cutting off of this upper Sudbury water would be a reduction of the quantity at Wamesit dam, or at Lawrence, by just the amount of the water so cut off." Counsel for the city then say, as they do now, that they suppose that it is so. Now, the amount of the evaporation on the water surface and wet-meadow surface, which is equivalent for all purposes of evaporation to water surface. during four months in the year, from May to September, not including September, — May, June, July, and August, the average of that, according to experiments which were tried on the Croton Water Works in New York, would amount to 41 feet per second; therefore, in order to furnish 288 feet at the Wamesit dam, 329 feet — that is, 288 plus 41 — must have certainly been poured into the Sudbury meadow, and as the Sudbury river furnishes 22 per cent. of that, — as we say, it furnishes 72 feet per second, — the Sudbury river furnishes 72 feet, and as that is to come to us without evaporation and without loss, in that way we really lose, by the taking of the Sudbury river, 72 feet out of the 288 feet (I may not have made this plain), and that is exactly 25 per cent. Of course this does not happen in the winter, and it is only during the four months when the evaporation is the largest that 25 per cent. is taken. As the evaporation is a fixed quantity, when the amount coming into the Concord river flowing over the Wamesit dam is less than 288 feet, the percentage would be larger; so that we say that the taking of the Sudbury river takes from our water at the Wamesit dam a fraction which amounts to 25 per cent. when there is 288 feet per second, and during the four months when the evaporation is the largest, and when less than 288 feet fall over the dams, the percentage is larger than that. Of course, as the amount increases beyond 288 feet per second, the percentage is reduced.

I have thus gone over the three considerations, first, how much the city takes from the Sudbury river; second, how much of the effective power runs in the Concord river; and,

in the third place, what proportion of it is taken.

The only remaining problem is to apply that to each mill, and ascertain what the loss of power is, and what it will cost practically to supply it. The Sterling mill, having 36 feet per second when there are 288 feet, has practically about 72 horse-power applicable to machinery, — effective horse-power; it is not the mathematical horse-power caused by the falling of water such a distance, but what can be got from awheel.

Commissioner Russell. How much is the fall?

Mr. Shattuck. It is a little over 24 feet. Of course, it varies with the height of the river. When the water is on the same level, of course it is always the same, unless there is back water below; but the higher the level the greater the

fall, unless there is back water.

Now, we take one-fourth of that 72 horse-power, and it gives us the loss on that mill, 18 horse-power. That proportion, as I have already said, will be larger if the water falls off, and will be smaller when the water increases in volume. That 18 horse-power must be furnished by steam. the mill were not there, no such mill as they have there now would be built after this water is taken; but the mill being there, the question is how much damage is caused? We get at it by ascertaining what we can replace that power for, and you have had testimony upon that point. Of course, we can get at it in two ways. We can ascertain what they sell power like that for in Boston, and what it is sold for in Lowell, where rents are a little lower and coal a little cheaper; and we are to consider all by supplementing the water, how much it laps over, as was testified to by the witness the other day. Of course, we don't care to consider, because it cannot be considered accurately, if there is any lapping over, but it is clear a larger steam-engine is required than the one to furnish 18 horse-power. You must have one two or three times larger, and that will make, as we say, where such a small amount of power is furnished, the cost, at least, \$150 per horse-power; and we ask for a sum which, at a fair rate of interest, certainly where a matter is certain, as it is here, at the present time. Not over 5 per cent. should be allowed, because it is something that is absolutely sure, — a sum which at 5 per cent. would furnish us with the horse-power permanently. Of course, it is in your hands to determine how much of the year. We say we should provide for it nine months, and the time when the steam will be used is not during any fixed period of the year; but nobody can determine, at any time, whether the engine may be wanted the next day after, and they must therefore always be ready with help and material to use the steam. therefore to be used under most unfavorable circumstances, and, as we say, an amount which will come practically to nine months in the year.

I think that it might be that, more or less, for nine months in the year. Of course we may have days where the stream supplied may be very small. On this theory we should be obliged to use steam, that is, there will be a limitation and diminution of our power, when the whole amount of water

running over the dam is 384 feet per second; because, when it falls below 384 feet per second, if we take out one quarter of it, it will fall below 288 feet. The question is, therefore, how many days in the year the water exceeds 384 feet per second, or equals 288 per second, and we say that it does not come up to that very large amount, did not come up to that very large amount, for more than three months in the year.

Mr. Butler. Did you state what the saving would be of

that amount?

Mr. Shattuck. I say what that amount would be as applied to this mill is a matter of easy calculation.

Mr. Butler. You have calculated it, I suppose?

Mr. Shattuck. I do not think I have the figures in my mind now. I don't care to calculate it in the opening; the witnesses can go through it more particularly than I can.

Mr. Butler. We have gone on with these cases for some weeks. I wish somebody would state how much they

have been injured.

Mr. Shattuck. Well, we have got very good materials. So that the damage begins when it falls below 384 feet per second.

Mr. Butler. I take that back; I believe brother Hodges did state that.

Commissioner Francis. Where does he get that 384? I do not understand.

Mr. Shattuck. I assume that the Sudbury river takes away one fourth of the water, and, therefore, if there was 384 feet flowing over the Wamesit dam and they took away one-fourth, that it would reduce it down to 288.

Mr. Butler. It was claimed before that 72 feet was taken.

Mr. Shattuck. Well, 72 feet when 288 is flowing. Of course the amount taken varies with the height of the river. If there was 384 feet flowing over the Wamesit dam, as it was before, there would be about 96 feet taken, and that 96 would reduce the amount down to 288,—an amount below that to which they were entitled. This is the difficulty: when there is the highest evaporation we were deprived of water three months, and the percentage as I have already stated.

I will only say as to the Belvidere Manufacturing Company, we have a mill situated here (pointing to the map).

Commissioner Russell. It is the Belvidere Company, and not the Stott mill?

Mr. Shattuck. The Belvidere mill. You have two; that is one. It is seventy-two feet per second, and, in other respects stands in the same footing.

Mr. Butler. They are seventy-two per second, and in all other respects the same.

Commissioner Russell. And that is included in this

same petition?

Mr. Shattuck. No, sir; that is in another petition which I have not put in until we come to the next case.

OPENING ARGUMENT OF DAN'L. S. RICHARDSON, ESQ.

Mr. RICHARDSON, before opening his argument, read the following petition:—

To the Hon. the Justice of the Superior Court now holden at Cambridge, within and for the County of Middlesex and Commonwealth of Massachusetts,—

Your petitioner, Samuel N. Wood, of Lowell, in said county, respectfully represents that he is now, and has been for more than three years now last past, the owner in fee simple, and possessed of a certain parcel of land, with the buildings and mill thereon, situate in said Lowell near the land owned by the Lowell Bleachery Company, described as follows, viz.: commencing at the southeasterly corner thereof at a stake at land formerly of Oliver M. Whipple, thence at an angle of 101° 18′ 35″ westerly by said land formerly of said Whipple, one hundred and eighty-one and one tenth feet to River Meadow brook; thence northeasterly along said brook fifty-one and 31-100 feet to a stake at land formerly of said Whipple; thence at an angle of 102° 59′ 09″ easterly along land formerly of said Whipple one hundred and seventy-nine and 57-100 feet to a stake; thence at an angle of 78° 41' 25" south 333° west fifty feet and 99-100 to the point begun at. Also the following described parcel situate in said Lowell, which is forever to be kept open as a street or way for the use of said Wood, his heirs and assigns and the abuttors thereon, commencing at the southwesterly corner of the above described premises at a stake, thence at an angle of 102° 59' 09" westerly, it being a continuation of the southerly line of the above described premises (and over said brook,) one hundred sixty-six and 50-100 feet to the easterly line of a street now or formerly called Orange street, which is forever to be kept open, thirty feet in width, and extend to its intersection with Crosby street, thence by the easterly side of Orange street thirty-one and 20-100 feet to a stake at land formerly of said Whipple; thence at an angle with said Orange street of 105° 40' by land formerly of said Whipple one hundred and sixty-five feet to a stake at the easterly side of said brook at a point twenty feet southerly by the northwest corner of the first-described premises, said street or way to be so constructed as not to diminish the capacity of said brook or to obstruct the flow of water therein. Also the right, privilege and easement to pass with care over the railroad leading from the Boston and Lowell, Lowell and Lawrence,

and Salem and Lowell railroads at Whipple's station, over land formerly of said Whipple to the first-described lot, as said railroad is now constructed, or as it may be constructed by the proprietors of the several grants now made, or which may be made by the said Whipple, his heirs and assigns, with the right to construct a side track over land formerly of said Whipple formerly, and within fifteen feet of the easterly line of the first-granted premises, and in a line parallel thereunto, which may be extended in the same direction to a point twenty-five feet northerly of the northeasterly corner of the first-described premises, the use of said railroad being in common with said Whipple, his heirs and assigns, and in common with other grants now made or which may be made by said Whipple, his heirs and assigns, being such right to use and rebuild the present railroad track as conveyed to him, subject to the rights of others in said tracks, and subject to changes of direction of said tracks, and in case said railroad shall be discontinued a right to pass and repass with teams over land formerly of said Whipple from Lawrence street to the aforesaid premises. Also, the right, privilege and easement forever to take water from the canal formerly of said Whipple to the extent hereinafter specified, said canal leading out of Concord river, and all in said Lowell, by means of a head raceway to enter said canal and conduct water therefrom to the above-described premises, to be used thereon, the same to be done in such manner as in no way to weaken said canal or the banks thereof or interrupt the flow of water in said canal. Also the right for said water to enter said canal from Concord river to the extent hereinafter specified. Also the right forever to have said canal and the banks thereof, and the permanent dam and flashboards, formerly of said Whipple, across Concord river, in said Lowell, and which dam has existed there more than twenty years, still continued for the purpose of affording a water-power to the extent and with the exceptions and reservations last herein set forth. The quantity of water which he has the right to draw from said canal by said Wood, his heirs and assigns, is strictly limited to and shall not exceed twelve cubic feet per second for eleven and one quarter hours per day of six days in the week, and if at any time the quantity of water in the canal shall not be equal to two hundred and eighty-eight feet per second during the above specified time, then said Wood, his heirs and assigns, shall, during such time, be restricted to one twenty-fourth part of the quantity of water in said canal. Also the right to conduct water into River Meadow brook by the tail raceway formerly of said Whipple. And your petitioner further represents that more than three years ago he constructed on said premises a mill with suitable wheels and apparatus for a grain-mill and for utilizing the water-power aforesaid, and has ever since used the same. And your petitioner further says that for more than three years now last past, and now, he is and has been seized and possessed of the land, buildings, rights, privileges, easements and water-power aforesaid, in fee simple, and of right ought to enjoy the same uninjured, and the use of the waters in Sudbury river and Farm pond and their tributaries, as they would naturally flow into Concord river and said

canal to his said premises, the said Sudbury river and Farm pond having been from time immemorial tributary to and flowing into said Concord river, and supplying the same in natural channels with large quantities of water above said dam and canal. your petitioner says that for more than three years last past he has had and still has and possesses in fee simple the right that said Concord river should flow in the same manner, quantity, volume and force, and within the same limits and channel, and with the same sources of supply as said river did before the action of the City of Boston, hereinafter set forth and had done from time immemorial, and that the water thereof should continue to flow to said dam and canal in its accustomed and ancient channel and by said canal (and head raceway and flume and suitable sluiceways made by the petitioner) on to his premises aforesaid, so that the quantity of water above described belonging to him might flow on to his said premises to be used by him for water-power and other purposes on said premises, and to flow over and off the same. And petitioner says he is and for more than three years last past has been seized and possessed in fee simple of the right to have the waters of said Farm pond, so called, situate in Framingham, in said county, and of Sudbury river, and their tributaries, flow in their natural and ancient channels into said Concord river above said dam and canal, and to said dam and canal, and through said canal to and on and over his premises aforesaid to supply him with his water-rights and water-power aforesaid thereon, as they naturally would have done, but for the acts and doings of said city as herein set out. And your petitioner further represents that by virtue of an act of the legislature of the Commonwealth of Massachusetts, entitled, "An Act to authorize the City of Boston to obtain an additional supply of pure water," approved April 8, 1872, the said City of Boston, situate in the county of Suffolk, has, within three years last past, first actually taken at the point or points authorized by said act, through the agency pointed out in said act, and for the purposes therein set forth, all the waters of said Sudbury river, and all the waters of said Farm pond, and of the streams and tributaries, whether natural or artificial, flowing into them, by means of certain dams, obstructions and works built by said city under said act and the authority thereof and for the purposes therein authorized, and still continues and maintains said taking and said dam, obstruction and works, and have withdrawn and diverted the waters of said Sudbury river and Farm pond, and their tributaries, from their natural flow, course and current, so that the waters thereof no longer flow into Concord river, and are prevented by said city from so flowing and from passing in their natural channel, and by said canal to and on said premises of your petitioner, as your petitioner is rightfully entitled to have them flow, and as they would flow naturally if not so interrupted. And your petitioner says by the said acts of the said City of Boston he is deprived of a large part of his water power, rights, mill privileges, and other rights aforesaid, and of his rights to the natural flow of water to and in said Concord river and to said dam and canal, and of the right to have the same flow from said Concord river by said

canal to and upon and over his said premises to supply his rights, easements, privileges and water-power aforesaid upon the premises aforesaid, and the City of Boston has taken and appropriated, as aforesaid, all the waters of said Sudbury river and Farm pond and their tributaries to their own use, to the great damage of your petitioner sustained in his property aforesaid. And your petitioner says that by the taking of the waters of said Sudbury river and Farm pond and their tributaries, and by the erection and maintenance of their said dam and works and the acceptance and exercise of the powers and privileges given by said act by said city, and by the acts and doings of said city under said act, and by their taking, interfering with and injuring the use and enjoyment of the water of said river, to which, at the time of said taking, your petitioner was justly entitled, your petitioner has sustained great damages in his property, and he has not agreed and has not been able to agree with said City of Boston upon the damages to be paid him therefor, and said city has not offered to pay him as damages any sum whatever. Wherefore your petitioner prays the Honorable Court for the assessment of his said damages for the taking of the said waters of said Sudbury river and Farm pond and tributaries and the acts and doings of said city aforesaid, and that after due notice and summons to said City of Boston this Honorable Court will appoint, upon default or hearing of said City of Boston, three judicious and disinterested freeholders of this Commonwealth who shall assess said damages according to law, and that all such other and further proceedings may be had in the premises as to law and justice shall appertain.

SAMUEL N. WOOD.

Lowell, June 10, 1875.

The next case will be Luther W. Faulkner, the same petition substantially.

COMMONWEALTH OF MASSACHUSETTS.

MIDDLESEX SS.

[L.S.] To the Sheriffs of our several Counties or their Deputies,

Greeting:—

We command you to summon the City of Boston, a municipal corporation, established under the laws of this Commonwealth, in the County of Suffolk, to appear before the Justices of our Superior Court, to be holden at Lowell within and for our County of Middlesex, on the first Monday of September next, and answer to the petition of Luther W. Faulkner, of Billerica, in said County of Middlesex, filed in the Office of the Clerk of the Courts for said County of Middlesex on the day of the date hereof, a true and attested copy of which petition is hereto annexed.

And have you there this writ with your doings thereon.

Witness, Lincoln F. Brigham, Esquire, at Cambridge, this tenth day of June, one thousand eight hundred and seventy-five.

THEO C. HURD, Clerk.

To the Honorable the Justice of the Superior Court, now holden at Cambridge, within and for the County of Middlesex and Commonwealth of Massachusetts:—

Your petitioner, Luther W. Faulkner, of Billerica, in said county, respectfully represents that he now is and has been for more than three years now last past the owner in fee simple and possessed of certain pieces or parcels of land, with the buildings thereon, situate in Lowell, in said county, which are bounded and described as follows, viz.: One piece or parcel of land situate on the southeasterly side of Grove street so called, containing about eight thousand seven hundred and forty-one square feet, thus bounded and described: beginning on the southeasterly side of said Grove street at a stone bound, which is about twenty feet distant southwesterly from a canal, thence running along land formerly of Ephraim B. Patch south twenty-nine degrees, east one hundred and fifty feet, to a stone bound; thence along land formerly of said Patch south thirty-three degrees, west sixty-six feet, to a stone bound; thence along land formerly of said Patch north twenty-nine degrees, west one hundred and fifty feet, to a stone bound at said Grove street; thence north thirty-three degrees, east along said Grove street sixty-six feet, to the point of beginning. Also a certain other piece or parcel of land, containing about eighteen thousand two hundred and eighty-one square feet, more or less, and thus bounded and described: beginning at a stone bound at the westerly corner of the premises at the southerly corner of land sold by Oliver M. Whipple to Alfred H. Chase, and conveyed by deed dated February 20th, 1863, thence running northeasterly by said Chase's land formerly, about one hundred and twenty-nine feet, to a drill-hole in the stone at Concord river; thence south twenty-four degrees, east in the said Concord river abour one hundred and seventy and seventy-four one-hundredths feet, to a corner of the river wall; thence south seventy-three degrees, west about thirty-three feet, to a corner of the wall on the west side of the raceway; thence south sixty-eight degrees, west, crossing said raceway seventy-seven and sixty-eight onehundredths feet to a stone bound; thence north thirty degrees, west about one hundred and fifty feet to the point begun at; also other land adjoining said last-described piece. And your petitioner further represents that he is and has been for more than three years now last past the owner and has possessed and now possesses the right, privilege, and easement, by means of the canal aforesaid leading from Concord river along the southwesterly side of said last-described parcel of land, to take water from said river, and by means of head raceways to enter the said canal at any point opposite said last-described parcel of land, and to conduct the water to the said last-described lot of land to be used thereon, also the right for the waters of said Concord river to enter said canal to the extent hereinafter specified, and the right forever to have said canal, and the banks thereof, and the permanent dam and flash-boards, formerly owned by Oliver M. Whipple, across said river in said Lowell, and which dam has there existed more than twenty years, still continued for the purpose of affording a

water-power, and to the extent and with the reservations and exceptions hereinafter contained. The quantity of water which your petitioner for more than three years now last past has had the right to draw, and now has the right to draw, from said river, by means of said canal, was and is twenty-five cubic feet per second, for eleven and one-quarter hours per day of six days of the week, subject, however, to this limitation, that, if at any time the quantity of water in said canal should not equal two hundred and eighty-eight cubic feet per second during the time aforesaid, then your petitioner was and is restricted to twenty-five two hundred eighty-eighths of the quantity of water in said canal. And your petitioner further says that he now is and has been for more than three years now last past the owner of a certain factory and mill situate upon the second-described lot of land, and used in the manufacture of woollen goods, and that the power for running the same was obtained from Concord river through the canal aforesaid, in the manner and to the extent hereinbefore stated. And your petitioner further says that for more than three years now last past he has been and now is seized and possessed of the land, buildings, rights, privileges, easements, and water-power aforesaid in fee simple, and of right ought to enjoy the same uninterrupted; and the use of the waters in Sudbury river and Farm pond and their tributaries as they would naturally flow into said Concord river and said canal to his said premises, the said Sudbury river and Farm pond having been from time immemorial tributary to and flowing into Concord river, and supplying the same in natural channels with large quantities of water above said dam and canal. And your petitioner says that for more than three years last past he has had and still has and possesses in fee simple the right that said Concord river should flow in the same manner, quantity, volume, and force, and within the same limits and channel, and with the same sources of supply, as said river did before the action of said City of Boston hereinafter set out, and had done from time immemorial; and that the water thereof should continue to flow to said dam and canal in its accustomed and ancient channel, and by said canal and head raceways and flume and suitable sluiceways made by petitioner on to his premises aforesaid so that the quantity of water above described belonging to him might flow on to his said premises to be used by him for water-power and other purposes on his said premises, and to flow over and off the same. And your petitioner says that he is and for more than three years last past has been seized and possessed in fee simple of the right to have the waters of said Farm pond so called, situate in Framingham, in said county, and of Sudbury river, and their tributaries, flow in their natural and ancient channels into said Concord river above said dam and canal, and to said dam and canal, and through said canal to and on and over his said premises to supply him with his water-rights and water-power as aforesaid thereon, as they naturally would have done but for the acts and doings of said City of Boston as herein set out. And your petitioner further represents, that, by virtue of an act of the Legislature of the Commonwealth of Massachusetts entitled, "An Act to authorize

the City of Boston to obtain an additional supply of pure water," approved April 8, 1872, the said City of Boston, situate in the County of Suffolk, has within three years last past, first, actually taken at the point or points authorized by said act, through the agency pointed out in said act, and for the purposes therein set forth, all the waters of said Sudbury river, and all the waters of said Farm pond, and of the streams and tributaries, whether natural or artificial, flowing into them, by means of certain dams, obstructions, and works built by said city, under said act and the authority thereof, and for the purposes therein authorized, and still continues and maintains said taking and said dam, obstructions, and works, and have withdrawn and diverted the waters of said Sudbury river and Farm pond and other tributaries, from their natural flow, course, and current, so that the waters thereof no longer flow into said Concord river, and are prevented by said city from so flowing and from passing in their natural channel, and by said canal to and on said premises of your petitioner, as your petitioner is rightly entitled to have them flow, and as they would flow naturally if not so interrupted. And your petitioner says that by the acts of the said City of Boston he is deprived of a large part of his water-power, rights, mill privileges, and other rights aforesaid, and of his right to the natural flow of water to and in said Concord river, and to said dam and canal, and of the right to have the same flow from said Concord river by said canal to and upon and over his said premises to supply his rights, easements, privileges, and water-power aforesaid upon his said premises, and the said City of Boston has taken and appropriated as aforesaid all the waters of said Sudbury river and Farm pond and their tributaries to their own use, to the great damage of your petitioner sustained in his property aforesaid. And your petitioner further says, that, by the taking of the waters of said Sudbury river and Farm pond and their tributaries, and by the erection and maintenance of their said dam and works, and by the acceptance of the powers and privileges given by said act by said city, and by the acts and doings of said city under said act, and by their taking and interfering with and injuring to the use and enjoyment. of the waters of said river, to which at the time of such taking your petitioner was justly entitled, your petitioner has sustained great damage in his property, and he has not agreed, and has not been able to agree, with said City of Boston upon the damages to be paid him therefor, and said city has not offered to pay him as such damages any sum whatever. Wherefore your petitioner prays this Honorable Court for the assessment of his said damages for the taking of the said waters of said Sudbury river and Farm pond and their tributaries, and the acts and doings of said city aforesaid, and that, after due notice and summons to said City of Boston, will appoint, upon default or hearing of said City of Boston, three judicious and disinterested freeholders of this Commonwealth, who shall assess said damages according to law; and that all such other and further proceedings may be had in the premises as to law and justice shall appertain.

DEED. 573

SUFFOLK, ss. Boston, July 16, 1875. By virtue hereof I this day summoned the City of Boston, within named, to appear and answer at Court, by giving in hand attested copies of this writ and petition annexed, to Charles H. Dennie, Esq., Treasurer, and Samuel F. McCleary, Esq., Clerk, of said City of Boston.

BENJAMIN F. BAYLEY, Deputy Sheriff.

Commissioner Russell. The description of the land, do you want, General?

Mr. Butler. No, sir; you need not read the descrip-

tion.

Mr. Richardson. Twenty-five feet per second. The answer is the same as in the other case, and I put in the deed. First, the deed of Ephraim B. Patch to Luther W. Faulkner, dated the fifth day of October, in the year 1863. a deed from Patch:—

Know all men by these Presents, That I, Ephraim B. Patch, of Lowell, in the County of Middlesex and Commonwealth of Massachusetts, in consideration of five thousand two hundred dollars, to me paid by Luther W. Faulkner, of Billerica, in said County of Middlesex, the receipt whereof is hereby acknowledged, do hereby remise, release and forever quitclaim unto the said Faulkner, his heirs and assigns, a certain piece or parcel of land situate in said Lowell, on the southeasterly side of Grove street, so called, containing about eight thousand seven hundred and fortyone square feet, thus bounded and described; beginning on the southeasterly side of said Grove street at a stone bound, which is about twenty-five feet distant southwesterly from the canal as it now exists; thence running along said Patch's other land, S. 29°, E. one hundred and fifty feet to a stone bound; thence along said Patch's other land, S. 33°, W. sixty-six feet to a stone bound; thence along said Patch's other land, N. 29°, W. one hundred and fifty feet to a stone bound at said Grove street; thence N. 33°, E. along said Grove street sixty-six feet to the point of beginning.

Also, a certain other piece or parcel of land situate in said Lowell, containing about eighteen thousand two hundred and eighty-one square feet, more or less, and thus bounded and described; beginning at a stone bound at the westerly corner of the premises at the southerly corner of land sold by Oliver M. Whipple to Alfred H. Chase, by deed dated February 20th, 1863; thence running northeasterly by said Chase's land, about one hundred and twenty-nine feet to a drill-hole in the stone at Concord river; thence S. 24°, E. in the said Concord river about one hundred and seventy and seventy-four one-hundredths feet to a corner of the river wall; thence S. 73°, W. about thirty-three feet to a corner of the wall on the east side of the raceway; thence S. 68°, W. crossing said raceway seventy-seven and sixtyeight one-hundredths feet to a stone bound; thence N. 30°, W.

about one hundred and fifty feet to the point of beginning.

Also, the right, privilege and easement to take water by meanof the canal of the grantor lying southwesterly of said lasts described parcel of land, and leading out of Concord river, and by means of head-raceways to enter the said canal at any point opposite said last-described parcel of land, and to conduct the water to the said last-described lot of land to be used thereon, the same to be done in such a manner as in no wise to injure or weaken the banks of said canal, or interrupt the flow of water therein. Also, the right for said water to enter said canal from the said Concord river to the extent hereinafter specified, and the right forever hereafter to have said canal and the banks thereof, and the permanent dam owned by the grantor across Concord river, continued for the purpose of affording a water-power, and to the extent and with the exceptions and reservations hereinafter contained and set forth. The quantity of water which may be drawn from the canal by the grantee, his heirs and assigns, is strictly limited to and shall not exceed fifteen cubic feet per second, for eleven and one-quarter hours per day of six days of the week. And if, at any time, the quantity of water in the canal shall not equal two hundred and eighty-eight cubic feet per second during the time aforesaid, then the grantee, his heirs and assigns, shall, during such time, be restricted to five ninety-sixths of the quantity of the water in the canal. Meaning that the quantity of water which may be drawn from the canal by the grantee, his heirs or assigns, shall never, at any time, exceed fifteen cubic feet per second for the above-specified time, however great may be the supply of water from the said canal, and that the quantity of water which may be taken by the grantee, his heirs or assigns, shall be restricted to such an amount less than fifteen cubic feet per second during the above-specified time as shall be equal to five ninety-sixths of the supply afforded from the canal, whenever the water in the canal shall be less than two hundred and eighty-eight cubic feet per second for eleven and one-quarter hours per day for six days of the week.

Also, the right to pass with cars over the railroad at Whipple's station to said last-described parcel of land, and over the premises of the grantor as the railroad is now constructed, or as it may be constructed hereafter by the grantee, or by the proprietors of the several rights or grants now made, or which may be made by the grantor, his heirs or assigns. But this right is to be used in common with other grants made by Oliver M. Whipple, or which may be made by the grantor, his heirs or assigns, and in common with the grantor, his heirs andassigns. Nor shall he or they be under any obligation to maintain said railroad or extend the same; meaning, only to grant the right to use in common with others the present railroad track, so long as the same may continue, with a right of rebuilding a track and using and maintaining the same as aforesaid, and subject to the rights of the Boston & Lowell, Lowell & Lawrence and Salem & Lowell Railroad Companies, and subject to such changes in the direction or situation of the track as the grantor, his heirs or assigns, may reasonably demand. And in case said railroad shall be discontinued, the

grantee, his heirs and assigns, shall have, so long as the railroad shall be discontinued, a right of way to pass and repass with teams from Lawrence street to the last-described lot over the space on the northeasterly side of said canal, between said canal and conveyed lots, which space is now owned by said grantor, but so as not to obstruct said space to the injury of said grantor, his heirs and assigns. Also the right to lay and maintain a railroad track on the bank of the canal between the last described lot and the canal, and to use the same in common with the grantor, his heirs and assigns. Also, the right to pass and repass with teams or otherwise, between Lawrence street and said last-described lot over Grove street and the bridge, and over the small strip of land on the northeasterly bank of the canal, but so as not to interrupt or interfere with the use of said strip for railroad or other purposes.

In case said Faulkner, his heirs or assigns, shall, within three years from the date hereof, pay to said Patch, or his heirs or assigns, the sum of three thousand dollars, then from and after the time of such payment, the quantity of water which may be drawn from the canal by the grantee, his heirs and assigns, may be increased, but so as in no event to exceed ten cubic feet per second, for eleven and one-quarter hours per day of six days of

the week, in addition to the fifteen cubic feet aforesaid.

And said Patch, for himself, his heirs and assigns, reserves the right forever, to discharge and deliver water into the river outside of the lot herein last described, and over a portion of said lot from a raceway twelve feet wide, already existing on his adjoining land as it now exists, and as it may reasonably be altered, and as new raceways from the canal into the same may hereafter be made, and said grantee, his heirs and assigns, hall nsever erect or make any building or structure or obstruction on his premises, so as to interfere with or interrupt the free passage of water from said raceway (as now existing, and as it may reasonably be altered, and as new raceways into the same may be made) over the lot last above-described, to the river outside said lot last above-described.

The said grantee, his heirs and assigns, shall not, by reason of abbutting on said river, or owning said premises, have the right to have the water from above in Concord river, flow in said river past said premises, but said Patch, his heirs and assigns, retain forever the right to dam said river above said premises, and to divert the water thereof into and along his said canal for the privilege herein conveyed, and for other privileges established and to be established. And the said grantee, his heirs and assigns, shall have the right to discharge the water from the last-described lot of land into Concord river, without obstruction, but so as not unreasonably to obstruct the flow of water in said river or tail-race.

And the grantor, for himself, his heirs and assigns, covenants with the grantee, his heirs and assigns, that he will, within seven months from this date, so enlarge the said canal, that the same shall be of sufficient capacity at all times, when the water in the river and canal is as high as the top of the said permanent dam in

Concord river, to carry and discharge not less than two hundred and eighty-eight cubic feet per second, of eleven and one-quarter hours per day of six days of the week, without the water therein at the head of the head raceways of the grantee being drawn down more than six inches below the top of said permanent dam.

And the said Patch, for himself, his heirs and assigns, further covenants that he will forever hereafter keep and maintain in suitable and proper condition and repair, the said canal enlarged to the capacity aforesaid, and the banks and parts and appurtenances thereof; also said permanent dam and the eight-inch flashboards as they are usually kept thereon, subject to such reasonable and temporary interruptions and hindrances as may be necessary in such maintenance and repairs. And this deed is on the express condition, that for affording reasonable facilities for measuring water taken from the canal by the grantee, his heirs or assigns, the head raceway of the grantee shall consist in whole or in part of a flume or flumes which shall not be less than fifteen feet in length with the sides and bottom smooth. And the grantor, his heirs and assigns, may, at any and all times, hereafter enter upon the said premises of the grantee, and make such measurements as may be requisite and proper for determining the quantity of water taken, and also for the purpose from time to time of repairing the wall and bank of the canal.

And I, Oliver M. Whipple, of said Lowell, at the request of said Patch, and by reason of the consideration aforesaid, do hereby release and forever discharge the above-described promises but none other, from a certain mortgage given me by said Patch, dated March 20th, 1863, and which covers a piece of land which includes the above-described premises; and I do hereby relinquish and convey unto said grantee, all the right, title and interest which I have, by virtue of said mortgage, in and to the above-described premises, but none other, so that the said grantee, his heirs and assigns, may forever hold and enjoy the above-descibred premises, free and unincumbered by said mortgage, and for this purpose, and for this purpose only, I hereby join in this deed, my object and purpose being to release from said mortgage the above-described premises without prejudice to my rights under said

mortgage to the remaining land.

To have and to hold the above-released premises, with all the privileges and appurtenances to the same belonging to the said Luther W. Faulkner, his heirs and assigns, to his and their use and behoof forever. And I, the said Ephraim B. Patch, for myself and my heirs, executors and administrators, do covenant with the said Faulkner, his heirs and assigns, that the premises are free from all incumbrances made or suffered by me, and that I will, and my heirs, executors and administrators shall, warrant and defend the same to the said Faulkner, his heirs and assigns, forever against the lawful claims and demands of all persons claiming by, through or under me, but against none other.

In witness whereof, we, the said Ephraim B. Batch and Oliver M. Whipple, have hereunto set our hands and seals this fifth day

of October, in the year of our Lord one thousand eight hundred and sixty-three.

E. B. PATCH, OLIVER M. WHIPPLE.

Signed, sealed and delivered in presence of

GEORGE F. RICHARDSON.

MIDDLESEX, SS.

October 5, 1863.

Then personally appeared the above-named Ephraim B. Patch and Oliver M. Whipple, and severally acknowledged the foregoing instrument to be their free act and deed.

Before me,

GEORGE F. RICHARDSON,

Justice of the Peace.

From that deed I will read the description. These two parcels of land, one a small parcel and one a large one, at different times in the different provisions, they were both finally embraced together. This gives a description of a quantity of land on the southeasterly side of Grove street, so called, containing about eight thousand seven hundred and forty-one square feet, thus bounded and described, beginning at the "southeasterly side of said Grove street, at a stone bound which is about twenty feet distant southwesterly from the canal as it now exists, thence running along said Patch's other land S. 29° E." etc., "to the point of beginning."

Mr. Butler. Do you put in the consideration?

Mr. Richardson. This was a consideration of \$5,200. "Also a certain other piece or parcel of land situate in said Lowell, containing about eighteen thousand two hundred and eighty-one square feet, more or less, and thus bounded and described: beginning at a stone bound at the westerly corner of the premises at the southerly corner of land sold by Oliver M. Whipple to Alfred H. Chase by deed dated February 20th, 1863, thence running northeasterly by said Chase's land about one hundred and twenty-nine feet to a drill-hole in the stone at Concord river, etc.," calling that just the same, as I believe in the others.

Mr. Butler. Exactly?

Mr. RICHARDSON. Yes. Then the next deed I put in, in the same proportions, and everything, when the water is below.

Mr. Butler. Yes, sir, everything.

Mr. Richardson. The next deed is dated —

Mr. Butler. State how many feet of water that gives for \$5,200.

Mr. RICHARDSON. Not exceeding fifteen cubic feet per

second, $11\frac{1}{4}$ hours per day. The next deed I put in is one from Patch, also signed by Oliver M. Whipple, dated the 11th of May, 1864:—

Know all men by these Presents, That, whereas, in a certain deed made by Ephraim B. Patch, of Lowell, in the County of Middlesex and Commonwealth of Massachusetts, to Luther W. Faulkner, of Billerica, in said County, dated the fifth day of October, A. D. 1863, and recorded in the north districts of Middlesex Registry of Deeds, Book 33, Page 490, there is contained the following provision: "In case said Faulkner, his heir and assigns, shall within three years from the date hereof pay to said Patch, or his heirs or assigns, the sum of three thousand dollars, then from and after the time of such payment the quantity of water which may be drawn from the canal by the grantee, his heirs and assigns, may be increased, but so as in no event to exceed ten cubic feet per second for eleven and one-quarter hours per day of six days of the week, in addition to the fifteen cubic feet aforesaid." And whereas said Faulkner has this day paid me the said sum of three thousand dollars therein mentioned, now, therefore, in consideration thereof to me paid by said Luther W. Faulkner, the receipt whereof is hereby acknowledged, I, the said Ephraim B. Patch, do hereby bargain, sell, and convey unto the said Faulkner, his heirs and assigns, the right to draw from said canal the increased quantity of water in said clause provided for, but so as in no event to exceed ten cubic feet per second for eleven and one-quarter hours per day of six days of the week, in addition to the fifteen cubic feet specified in said deed, the same to be used on the premises conveyed by said Patch to said Faulkner by said deed, and in the manner and subject to the provisions contained in said deed.

And I, Oliver M. Whipple, of said Lowell, at the request of said Patch, and by reason of the consideration of twenty-five hundred and forty-five dollars to me paid, do hereby release and forever discharge the above-described premises, but none other, from a certain mortgage given me by said Patch, dated the twentieth day of March, A. D. 1863, and which covers a piece of land and water power which include the above-described premises, and I do hereby convey, relinquish and release unto the said grantee, his heirs and assigns, all the right, title, and interest which I have by virtue of said mortgage in and to the above-described premises, but none other; so that the said grantee, his heirs and assigns, may forever hold and enjoy the above-described premises free and unincumbered by said mortgage; and for this purpose and for this purpose only I hereby join in this deed, my object and purpose being to release from said mortgage the above-described premises without prejudice to my rights under said mortgage to the remaining land and water power embraced therein.

To have and to hold the above-conveyed premises with all the privileges and appurtenances to the same belonging to the said Faulkner, his heirs and assigns, to his and their use and behoof forever.

And I, the said Ephraim B. Patch, for myself and my heirs, ex-

ecutors, and administrators, do covenant with the said Faulkner, his heirs and assigns, that the premises are free from all incumbrances made or suffered by me, and that I will, and my heirs, executors, and administrators shall, warrant and defend the same to the said Falkner, his heirs and assigns, forever against the lawful claims and demands of all persons claiming by, through, or under me, but against none other.

In witness whereof we, the said Ephraim B. Patch and Oliver M. Whipple, have hereunto set our hands and seals this eleventh

day of May in the year eighteen hundred and sixty-four.

E. B. PATCH, OLIVER M. WHIPPLE.

Signed, sealed, and delivered, in presence of

DANIEL S. RICHARDSON.

MIDDLESEX, SS.

May 12, 1864.

Then personally appeared E. B. Patch and Oliver M. Whipple and acknowledged the above instrument by them subscribed to be their free act and deed. Before me,

DANIEL S. RICHARDSON,

Justice of the Peace.

COMMONWEALTH OF MASSACHUSETTS.

Lowell, May 12, 1864.

Recorded in the Registry of Deeds for the Northern District of Middlesex, in Book 38, Page 88.

A. B. WRIGHT, Register.

Mr. Richardson. This deed was a deed agreeing for a future payment. "In case the said Faulkner, his heirs and assigns, shall, within three years from the date thereof, pay to said Patch, or his heirs or assigns, the sum of three thousand dollars, then from and after the time of such payment the quantity of water which may be drawn from the canal by the grantee, his heirs and assigns, may be increased, but so as in no event to exceed ten cubic feet per second for eleven and one quarter hours per day, of six days of the week, in addition to the fifteen cubic feet aforesaid." There are two lots of land described here, so it would be 2,500 cubic feet. The money was paid and the right vested. After Mr. Faulkner purchased this land he erected a mill and machinery, a raceway, placed in a wheel for the enjoyment of this water-power, and has been in the use and occupation of it alone with his partners from the time that the mill was completed down to this time. I do not propose to add anything in the opening as to the evidence, - as to the matter of calculating the

measure of our damages. I take the evidence that is in already as to that, with the additional evidence that we shall have from Mr. Frizell, whom we will examine, which, while it does not go over a considerable period of time, I think will furnish some aid to you during that period of time of the condition of the river, from which you can calculate the quantity of water during other portions of the year. It is unnecessary for me, perhaps, to state at this time how much water I think the evidence will show has been taken, as I do not wish to occupy your time on that head. I do not propose to put in any other evidence in this case than the condition of the property and the evidence of the condition of the water for such times of the year, at sundry times, as we shall be able to get it from the witnesses and from the measurements during the short period of Mr. Frizell's connection.

The next case is the case of Samuel N. Wood, who gives the description of land I need not read. It is the lot you saw adjoining the bleachery. The consideration was \$4,000 in this deed.

Commissioner Russell. Who from?

Mr. RICHARDSON. This is a deed from Oliver M. Whipple himself. It bears date the 21st day of August, 1862.

Know all men by these Presents, That I, Oliver M. Whipple, of Lowell, County of Middlesex and Commonwealth of Massachusetts, in consideration of four thousand dollars, to me paid by Samuel N. Wood, of Lowell, aforesaid, the receipt whereof I do hereby acknowledge, do give, grant, bargain, sell and convey unto said Wood, a certain piece or parcel of land situated in said Lowell, near land owned by Lowell Bleachery Company, described as follows, viz.: commencing at the southeasterly corner of the premises at a stake at land of the grantor; thence at an angle of 101° 18' 35" westerly, by land of the grantor, one hundred eighty-one and one-tenth feet to River Meadow brook; thence northeasterly along said brook fifty-one and thirty-one one hundredths feet to a stake at land of grantor; thence at an angle of 102° 59′ 09″ easterly, along land of the grantor, one hundred seventy-nine and fifty-seven one hundredths feet, to a stake; thence at an angle of 78° 41′ 25" south, thirty-three and three-fourths degrees west, fifty feet and ninety-nine one hundredths to the point begun at; also, the following described parcel, which is forever to be kept open as a street or way for the use of said grantee, his heirs and assigns, and the abuttors thereon, commencing at the southeasterly corner of above-described premises at a stake; thence at an angle of 102° 59' 09" westerly, it being a continuation of the southerly line of the above-described premises (and over said brook) one hundred sixty-six and fifty one hundredths feet to the easterly line of a new street designated on plan of land of the grantor, as Orange street, which is forever

to be kept open thirty feet in width and extend to its intersection with Crosby street; thence by the easterly side of Orange street, thirty-one and twenty one-hundredths feet to a stake of land of grantor; thence at an angle with said Orange street 105° 40' by land of the grantor, one hundred and sixty-five feet to a stake at the easterly side of said brook, at a point twenty feet southerly by the northwesterly corner of the first-described premises (said street or way to be so constructed as not to diminish the capacity of said brook, or to obstruct the flow of water therein), also, the right, privilege and easement to pass with cars over the railroad leading from the Boston and Lowell railroad, Lowell and Lawrence and Salem & Lowell Railroads at Whipple station, over land of the grantor to the first-described lot. As said railroad is now constructed, or as it may be constructed by the proprietors of the several grants now made or which may be made by the grantor and his heirs and assigns, and the grantee may construct a side track over land of the grantor and within fifteen feet of the easterly line of the first-granted premises and in a line parallel therewith, which may be extended in the same direction to a point seventyfive feet northerly of the northeasterly corner of the first-granted premises; but the use of said railroad and side track is to be in common with grantor, and his heirs and assigns, and in common with other grants now made or which may be made by the grantor and his heirs and assigns, meaning only to grant the right to use in common the present railroad track, so long as it may be continued over premises of grantor, with a right to rebuild the same, so far as the grantor may have a right so to do. But the grantor, or his heirs and assigns, shall be under no obligation to maintain said railroad or said track, and this grant is made subject to the right of the Boston and Lowell, Lowell and Lawrence, and Salem & Lowell Railroad Companies, and all others having rights therein, and subject to such changes in direction of said track as the grantor, and his heirs and assigns, and others interested may reasonably demand, and in case said railroad shall be discontinued, the grantee and his heirs and assigns, shall have a right to pass and re-pass with teams over land of the grantor, from Lawrence street to the premises conveyed, but not so as to obstruct said space to the injury of the grantor, and his heirs and assigns, or others having right thereon; also, the right, privilege and easement forever to take water from the canal of the grantor to the extent hereinafter specified (which canal is to be extended by the grantor within sixty days), in front of the whole easterly line of first-conveyed premises, said canal leading out of Concord river, and by means of a head raceway the grantee, his heirs and assigns, may enter said canal and conduct water therefrom to the above-granted premises, to be used thereon, the same to be done in such a manner as in no wise to weaken said canal, or the banks thereof, or intercept the flow of water in said canal, also, the right of said water to enter said canal from Concord river to the extent hereinafter specified; also, the right forever hereafter to have said canal and the banks thereof, and the permanent dam of the grantor across Concord river continued for the purpose of affording a water-power to

the extent and with the exceptions and reservations hereinafter set forth. The quantity of water which may be drawn from said canal by the grantee and his heirs and assigns is strictly limited to, and shall not exceed, twelve cubic feet per second, for eleven and onequarter hours per day, of six days in the week; and if at any time the quantity of water in the canal shall not be equal to two hundred and eighty-eight feet per second, during the above specified time, then the grantee, and his heirs and assigns, shall during such time be restricted to one twenty-fourth part of the quantity of water in said canal, meaning that the said quantity of water to be drawn by the grantee, and his heirs and assigns, shall at no time exceed twelve cubic feet per second, for above-specified time, however great the supply of water may be in the canal, and shall be restricted to such an amount as shall be equal to one twenty-fourth part of the supply of water afforded by the canal, whenever the water in the canal is less than two hundred and eighty-eight cubic feet per second for above-specified time, and the grantor, for himself and his heirs and assigns, covenants with the grantee, and his heirs and assigns, that he will, within six months from date hereof, so enlarge said canal, that the same shall be of sufficient capacity so as at all times, when the water in the river and canal is as high as the top of the permanent dam in Concord river, to carry and discharge not less than two hundred and eighty-eight cubic feet of water per second, for eleven and one-quarter hours per day, of six days in the week, without the water at the head of the head race-way of the grantor being drawn down more than six inches below the top of said permanent dam, and said grantor, for himself and his heirs and assigns, covenants with the grantee, and his heirs and assigns, to maintain and keep in suitable repair the said canal so enlarged to the capacity aforesaid, and the banks and appurtenances thereof; also the said permanent dam and the eightinch flash-boards, so far as the grantor has a right to use them, subject to such reasonable and temporary interruptions as may be necessary for such maintenance and repairs, and this deed is subject to the condition that for affording reasonable facilities for measuring the water taken from the land by the grantee, and his heirs and assigns, the head raceway of the grantees shall consist in whole or in part of a flume or flumes which shall not be less than fifteen feet in length with the sides and bottom smooth; and the grantor and his heirs and assigns, may at any time and at all times hereafter enter upon the premises and make such admeasurement as may be necessary to determine the quantity of water taken by the grantee and his heirs and assigns; also the right, privilege, and easement to the grantee and his heirs and assigns to enter a tail raceway of the grantor, to be constructed by the grantor on his premises within fifteen feet of the northerly line of the conveyed premises, and to be forever used by said grantee, his heirs and assigns, in common with the grantor and his heirs and assigns for conveying water into River Meadow brook.

To have and to hold the above-granted premises to the said Samuel N. Wood, his heirs and assigns, to his and their use and behoof forever, and the said Oliver M. Whipple, for myself and

my heirs, executors, and administrators, do covenant with the said Wood, his heirs and assigns, that I am lawfully seized in fee simple of the afore-granted premises; that they are free from all incumbrances; that I have good right to sell and convey the same to the said Wood, his heirs and assigns, forever as aforesaid; and that I will, and my heirs, executors, and administrators shall, warrant and defend the same to the said Wood, his heirs and assigns, forever against the lawful claims and demands of all persons.

In witness whereof, I, the said Oliver M. Whipple and Sarah K. Whipple, my wife, in token of her release of all right, dower, and homestead in the granted premises, have hereunto set our names and seals this twenty-first day of August, in the year of our

Lord eighteen hundred and sixty-two.

OLIVER M. WHIPPLE. [SEAL.] SARAH K. WHIPPLE. [SEAL.]

In presence of

E. B. PATCH.

The words "are," "the," "is," "corner," "feet," "and," "others interested," "shall by the grantor," his heirs," and assigns," "be not," "all right," inserted before signing.

MIDDLESEX, SS.

Sept. 1, 1862.

Then personally appeared the above-named Oliver M. Whipple and acknowledged the above instrument to be his free act and deed. Before me.

E. B. PATCH,

Justice of the Peace.

Recorded September 2, 1862.

A. B. WRIGHT, Register.

The above is a true copy of Deed, Whipple to Wood, dated August 21, 1862, and recorded in book 32, page 15.

Attest:

J. P. THOMPSON,

Register.

Lowell, June 4, 1875.

This deed will present a little difference in the original title from that of some of the other deeds in this case; I don't know that it will be of any importance, except that I shall put in a fact which will be necessary in order to show that the grant power could be enjoyed. In the other deeds they were upon the canal, or the canal existed so far down that they could take the water as the canal then stood. In these deeds, the grant in this deed and also in the next one which I shall allude to — perhaps I had better read the exact description; it is the same privilege as a railway: "also the right privilege, and easement forever to take water from the canal of the grantor to the extent hereinafter specified, (which canal is to be extended by the grantor within sixty

days), in front of the whole easterly line of first-conveyed premises, said canal leading out of Concord river and by means of a head raceway." You will observe while in the former cases the canal had already been built down to only where this land was located, this grants the right to take the water; the grant shall not exceed twelve cubic feet, and that right was to take it from that canal with an agreement that the canal should be extended from where it then ended, past the whole site of this land, which was afterwards done. The purchase and consideration was paid for the land as it stood, with no improvements, no appliances for the use of water, nor was there on Mr. Faulkner's when he purchased. After the purchase was made Mr. Wood went to work and constructed a grist-mill, and mill apparatus, which was finished within a year, perhaps, and while that was going on the canal was finished from where it ended at the time of the grant, and finished past this land of Mr. Wood and extended down to the northerly line of the bleachery lot, which I shall come to next, where they could use it. We shall show that Mr. Wood, after constructing his mill and putting in his wheel, has occupied it from that time down to this. So far as you saw in your view the fact that, while the other mills on this stream were all running, we shall show no water whatever going down the canal on the Wamesit Power Company's last stream, there will be some evidence to explain it; although, probably, you will not find it necessary to find any certain explanation why it is that no water flows there when the other mills own a divided interest in the water and have a right to run. It grows out of, I suppose, as my brother Butler suggested, either a difference of opinion in the rights of the owners above to use the water, more probably, out of the difficulty which exists and always exists when different parties have the right to take a defined share out of a whole quantity of water — the difficulty of measuring it and the difficulty of each getting their rights in the right of water.

It was said that the water did not come, could not come to Mr. Wood and the bleachery, and therefore the city ought not to pay them any damages if they have taken the water which otherwise, if they had not taken it, could not have reached Mr. Woods and the bleachery there. If it was an impossibility that any of that water could reach the land of Mr. Wood or the bleachery, or, if it was utterly useless, I do not know but such remarks might have some cognizant direction. But we shall show we had a large portion, differing, perhaps, according as you take the proof that shows it of the 288 cubic feet, which was the original division of power that it was supposed the Concord river would

furnish through this canal; we will show that that, or some portion of it, greater or less, actually exists in the river and goes into the canal at its opening. And if we show in addition to that, that we have a definite, undivided portion of that whole amount, the fact that others use it and deprive us of it as it is used, I think we shall ask you to consider there is no evidence; therefore, the city has a right to take it without any compensation. That is, I shall claim that the water which was granted to us by these deeds, and this canal to come out of the river, gives us the right to take that water going down the Concord into this canal, into our premises. And if we show that, at the entrance of the canal, we had a certain number of cubic feet of water that was there measured in a certain power, then we have the right to the value of that water from the city, and, if they stop it from coming to that place, it is no answer that, through the fault of others, we do not have the benefit of that water before it reaches our place. That peculiarity will exist the same in the cases of the Bleachery and in the case of Mr. Wood, and after the division of this water among the earliest days, it was found that from the quantity of water taken from the upper mills, so that this amount that existed in the canal. entered and existed in the canal, was so much diminished that during the eleven hours of the day when the other mills could run, Mr. Wood had no power a good deal of the time; whereas, the deed provided that when the power stood at 288 cubic feet, he should have so many feet of that; so long as there was any water, however small, in the canal, he should have the same proportion of that the other millowners did. And this, perhaps, arose from great difficulty in using the water during the eleven hours of the day; in dividing it, or whatever it arose from; the owners of what is now the Wamesit Power Company requested Mr. Wood to abandon the trying to use his power in the daytime for a long period of time, but use it nights, and paid him some money for the extra trouble, and he has been obliged, from time to time, to get his power when others were not using it. But that is a matter that has been for the convenience of the parties; the question that you are to try here is, or the matter that you are to settle, is upon the rights granted to us by the deed.

Mr. Butler. Your Honor will see that this is the exact converse of the proposition argued yesterday, that where the upper proprietors furnished water, it should aid.

Commissioner Russell. Not quite.

Mr. RICHARDSON. I think not. The answers are the same in each case.

Commissioner Russell (addressing the official stenographer). Make the memorandum, if you please, in the case of Luther W. Faulkner and Samuel N. Wood, and I suppose the same with the Lowell Bleachery, to which you are coming next.

Mr. Richardson. The same precisely.

Commissioner Russell (addressing the official stenographer). The answers are the same as in the Wilder case, and therefore need not be printed.

Mr. Richardson. The next case is that of the Lowell

Bleachery.

COMMONWEALTH OF MASSACHUSETTS.

MIDDLESEX, SS.

To the Sheriffs of our several Counties or their Deputies.

GREETING:

We command you to summon the City of Boston, a municipal corporation established under the laws of this Commonwealth, in the County of Suffolk, to appear before the justices of our Superior Court, to be holden at Lowell, within and for our County of Middlesex, on the first Monday of September next, and answer to the petition of the Lowell Bleachery, a body corporate duly established by law at Lowell aforesaid, filed in the office of the Clerk of the Courts for said County of Middlesex on the day of the date hercof, a true and attested copy of which petition is hereto annexed. And have you there this writ with your doings thereon.

Witness, Lincoln F. Brigham, Esquire, at Cambridge, this tenth day of June, one thousand eight hundred and seventy-five.

THEO. C. HURD, Clerk.

To the Honorable the Justice of the Superior Court, now holden at Cambridge, within and for the county of Middlesex, and Commonwealth of Massachusetts.

Your petitioners, the Lowell Bleachery, a body corporate, duly established by law at Lowell, in said county, respectfully represent that they are now and have been for more than three years now last past, the owners in fee-simple and possessed of certain pieces or parcels of land situate in said Lowell, which are bounded and described as follows, viz.: beginning at the southwesterly corner of the premises, at a point on the northerly side of Moore street, at a post and at other land of said Lowell Bleachery; thence easterly along Moore street, one hundred and six and $\frac{5}{10}$ feet to another street laid out by Oliver M. Whipple, thirty feet in width; thence along the westerly line of said last-named street at an angle with Moore street of 89°, and running north 5° and 50′ west, eleven hundred and seven and $\frac{5}{10}$ feet to a stake; thence at an

angle of 106° 21′, and running north 86° west along land formerly of Oliver M. Whipple, to River-meadow brook, so called; thence crossing said River-meadow brook and continuing in the same direction along the southerly side of another street laid out by said Whipple, thirty feet in width, to a stone bound at the corner of a fence at other land of said Lowell Bleachery, at Babcock street; thence easterly along other land of said Lowell Bleachery to a stone bound; thence south 1° east along other land of said Lowell Bleachery, eleven hundred and eight and $\frac{80}{100}$ feet to the point of

beginning on Moore street.

Your petitioners further represent that they are and have been for more than three years now last past the owners and have possessed and now possess the right, privilege and easement by means of a canal leading from Concord river along the northerly line of the aforesaid premises to take water from said river, and by means of a head raceway to conduct the water therefrom on to and through premises of your petitioner; also the right for the waters of said river to enter and flow through said canal to the extent hereinafter specified, and the right forever to have said canal from Concord river and the banks thereof and the permanent dam and flash-boards formerly owned by Oliver M. Whipple, across Concord river in said Lowell, and which dam has there existed more than twenty years, still continued for the purpose of affording water for any and all purposes of a water-power, and to the extent and with the exceptions and reservations hereinafter set forth. The quantity of water which your petitioner for more than three years now last past has had and now has the right to draw from said river by means of said canal, was and is limited to thirty-six cubic feet per second for eleven and one-quarter hours per day of six days of the week, subject, however, to this limitation, that if at any time the quantity of water in said canal shall not equal two hundred and eighty-eight cubic feet per second during the time aforesaid, then your petitioners during such time were restricted to one-eighth of the quantity of water in said canal.

Your petitioners further represent that they now are and have been for more than three years now last past the owners in feesimple of other lands adjoining the above-described premises on which are and were situate various mills, factories, bleaching and dye works and apparatus of great value, and the waters of said Concord river obtained by means of said canal and raceway were and are used by them in connection with their said works for the

various purposes thereof.

Your petitioners further say that for more than three years now last past they have been and now are seized and possessed of the land, buildings, rights, privileges, easements and water-power aforesaid, in fee-simple, and of right ought to enjoy the same uninjured and the use of the waters in Sudbury river and Farm pond and their tributaries as they would naturally flow into Concord river and said canal to their premises aforesaid, the said Sudbury river and Farm pond having been from time immemorial tributary to and flowing into said Concord river and supplying the same in natural channels with large quantities of water above

said dam and canal. And your petitioners say that for more than three years last past they have had and still have and possess in fee-simple the right that said Concord river should flow in the same manner, quantity, volume and force, and within the same limits and channel and with the same sources of supply as said river did before the action of the City of Boston, hereinafter set forth, and had done from time immemorial, and that the water thereof should continue to flow to said dam and canal in its accustomed and ancient channel and by said canal and head raceway and flume and suitable sluiceways made by the petitioners on to their premises aforesaid, so that the quantity of water above described belonging to them might flow on to their said premises to be used by them for all purposes on premises belonging to them, and to flow over and off the same. And your petitioners say that they are, and for more than three years last past, have been seized and possessed in fee simple of the right to have the waters of said Farm pond, so called, situate in Framingham, in said county, and of Sudbury river and their tributaries flow in their natural and ancient channels into said Concord river, above said dam and canal and to said canal and dam, and through said canal to, on and over their premises to supply them with their water-rights and with water aforesaid thereon, as they naturally would have done but for the acts and doings of said city as herein set out. And your petitioners further represent that by virtue of an act of the Legislature of the Commonwealth of Massachusetts, entitled "An act to authorize the City of Boston to obtain an additional supply of pure water," approved April 8, 1872, the said City of Boston, situate in the County of Suffolk, has within three years last past, first actually taken at the point or points authorized by said act, through the agency pointed out in said act and for the purposes therein set forth, all the waters of said Sudbury river and all the waters of said Farm pond and of the streams and tributaries, whether natural or artificial, flowing into them by means of certain dams, obstructions and works, built by said city in said town of Framingham, under said act and the authority thereof, and for the purposes therein authorized, and still continues and maintains said taking and said dam, obstructions and works, and have withdrawn and diverted the waters of said Sudbury river and Farm pond, and their tributaries, from their natural flow, course and current, so that the waters thereof no longer flow into Concord river, and are prevented by said city from so flowing and from passing in their natural channel, and by said canal to and on said premises of your petitioners as your petitioners are rightly entitled to have them flow, and as they would flow naturally if not so interrupted. And your petitioners say that by said acts of said City of Boston they are deprived of a large amount of water, water-power, rights, mill privileges and other rights aforesaid, and of their right to the natural flow of water to and in said Concord river, and to said dam and canal, and of the right to have the same flow from said Concord river by said canal, to and upon and over their said premises to supply their rights, privileges, easements, water and water-power aforesaid, upon their premises, and the City

of Boston has taken and appropriated as aforesaid all the waters of said Sudbury river and Farm pond and their tributaries to their own use, to the great damage of your petitioners, sustained in their property aforesaid. And your petitioners say that by the taking of the waters of Sudbury river and Farm pond and their tributaries. and by the erection and maintenance of their said dam and works, and by the acceptance and exercise of the powers and privileges given by said act by said city, and by the acts and doings of said city under said act, and by their taking and interfering with and injuring the use and enjoyment of the waters of said river, to which, at the time of such taking, your petitioners were justly entitled, your petitioners have sustained great damage in their property, and they have not agreed and have not been able to agree with said City of Boston upon the damages to be paid them therefor, and said city has not offered to pay them, as such damages, any sum whatever. Wherefore your petitioners pray this Honorable Court for the assessment of their said damages for the taking of said waters of said Sudbury river and Farm pond, and their tributaries, and the acts and doings of said city aforesaid, and that after due notice and summons to said City of Boston, this Honorable Court will appoint, upon default or hearing of said City of Boston, three judicious and disinterested freeholders of this Commonwealth, who shall assess said damages according to law, and that all such other and further proceedings may be had in the premises as to law and justice shall appertain.

The Lowell Bleachery, by

F. R. APPLETON,

Ac'y Lowell Bleachery.

D. S. & G. F. RICHARDSON, Attorneys for Petitioners.

June 10, 1875.

Suffolk, ss.

Boston, July 16, 1875.

I, this day, summoned the within-named City of Boston to appear and answer at court, by giving in hand attested copies of this writ, and of the petition thereto annexed, to Charles H. Dennie, Esq., Treasurer, and Samuel F. McCleary, Esq., Clerk of said City of Boston.

Service and travel, \$2.08 Copies, 7.00

\$9.08

BENJ. F. BAYLEY,

Deputy Sheriff.

Mr. RICHARDSON. The Bleachery lot was the last lot that Mr. Whipple owned before you arrived at the land of the Bleachery: Mr. Wood's is the one before. The grant was made to the Bleachery in a similar manner.

Mr. Butler. I guess you had better read from the deed.

Know all men by these Presents, that I, Oliver M. Whipple, of Lowell, in the County of Middlesex, and Commonwealth of Massachusetts, in consideration of thirteen thousand five hundred dollars to me paid by the Lowell Bleachery, a body corporate, duly established by law at said Lowell, the receipt whereof is hereby acknowledged, do hereby give, grant, bargain, sell and convey unto the said Lowell Bleachery, their successors and assigns forever, a certain piece or parcel of land, situated in said Lowell, and thus bounded and described: beginning at the southwesterly corner of the premises, at a point on the northerly side of Moore street, at a post and at land of said Lowell Bleachery; thence easterly along Moore street, one hundred and six and five one hundredths feet to a new street, to be laid out by the grantor thirty feet in width along the whole easterly side of the premises hereby conveyed, which street is also to be extended by the grantor in the same direction, northerly until it intersects a street or way now leading to Lawrence street; thence along the westerly line of said new street at an angle with Moore street of 89°, and running north 5° 50' west, eleven hundred and seven and two tenths feet to a stake; thence at an angle of 106° 21', and running north 86° west, along other land of the grantor to River-meadow brook, so called; thence crossing said River-meadow brook, and continuing in the same direction along the southerly side of a new street, to be laid out by the grantor thirty feet in width to a stone bound at the corner of a fence at land of the grantees at Babcock street; thence easterly along land of the grantees to a stone bound; thence south 1° east along land of the grantees eleven hundred and eight and eighty one hundredths feet, to the point of beginning on Moore

Also the right, privilege and easement to take water by means of the canal of the grantor, leading out of Concord river, which canal is to be extended by the grantor to the northerly line of the premises hereby conveyed, and by means of a head raceway to enter said canal thus extended, and conduct the water therefrom, the same to be done in such manner as in no wise to injure or weaken said canal. And the said grantor hereby covenants and agrees with the said grantees, their successors and assigns, that he will construct and extend said canal, from the termination of his present canal leading out of Concord river, up to a point on the northerly line of the premises hereby conveyed, within ten feet westerly of the railroad track as now constructed, within sixty days from the day of the date hereof. Also, the right for said water to enter and flow through the canal from Concord river, and its extension to the extent hereinafter specified, and the right forever hereafter to have said canal from Concord river to its termination as extended, and the banks thereof, and the permanent dam owned by the grantor across Concord river, continued for the purpose of affording water for any and all purposes, and a water-power, and to the extent and with the exceptions and reservations hereinafter set forth. The quantity of water which may be drawn from the canal by the grantees, their successors and assigns, is strictly limited to and shall not exceed thirty-six cubic feet per second, for

eleven and one-quarter hours per day of six days of the week. And if at any time the water in the canal shall not equal two hundred and eighty-eight cubic feer per second, during the time aforesaid, then the grantees, their successors and assigns, shall during such time be restricted to one-eighth of the quantity of water in the canal. Meaning that the quantity of water which may be drawn from the canal by the grantees, their successors or assigns, shall never at any time exceed thirty-six cubic feet per second, for the above-specified time, however great may be the supply of water from the said canal, and that the quantity of water which may be taken by the grantees, their successors or assigns, shall be restricted to such an amount less than thirty-six cubic feet per second, during the above-specified time, as shall be equal to one-eighth of the supply afforded from the canal, whenever the water in the canal shall be less than two hundred and eighty-eight cubic feet per second, for eleven and one-quarter hours per day, for six days of the week.

And the said grantor, for himself his heirs and assigns, covenants with the grantees, their successors and assigns, that he will, within six months from this date, so enlarge his said canal leading from Concord river to the northerly line of the premises hereby conveyed, that the same shall be of sufficient capacity at all times, when the water in the river and canal is as high as the top of the said permanent dam in Concord river, to carry and discharge not less than two hundred and eighty-eight cubic feet per second, of eleven and one-quarter hours per day, of six days of the week, without the water therein at the head of the head race-ways of the grantees being drawn down more than six inches below the top of said permanent dam. And the said Whipple, for himself, his heirs and assigns, further covenants that he will forever after keep and maintain in suitable and proper condition and repair said canal, enlarged to the capacity aforesaid, and the banks, and parts, and appurtenances thereof; also the permanent dam aforesaid, and the eight-inch flash-boards as they are usually kept thereon, subject to such reasonable and temporary interruptions as may be necessary

Reserving to the grantor, his heirs and assigns, and to all other parties having any legal right or interest therein, the right in common with the grantees, their successors and assigns, to use the railroads upon the premises hereby conveyed, as now constructed.

in such maintenance and repairs.

This deed is on the express condition, that for affording reasonable facilities for measuring water taken from the canal, by the grantees, their successors or assigns, the head race-way of the grantees shall consist in whole or in part of a flume or flumes, to be located at the termination of the canal as extended as aforesaid, which shall not be less than fifteen feet in length, with the sides and bottom smooth. And the grantor, his heirs and assigns, may at any and all times hereafter enter upon the premises hereby conveyed, and with a competent engineer make such admeasurement as may be requisite and proper for determining the quantity of water taken.

To have and to hold the above-granted premises, with all the

privileges and appurtenances thereto belonging to the said Lowell Bleachery, their successors and assigns, to their use and behoof forever. And I, the said Whipple, for myself, and my heirs, executors and administrators, do covenant with the said Lowell Bleachery, their successors and assigns, that I am lawfully seized in fee-simple of the aforegranted premises; that they are free from all incumbrances, and that I have good right to sell and convey the same to the said Lowell Bleachery, their successors and assigns as aforesaid. And that I will, and my heirs, executors and administrators shall, warrant and defend the same, to the said Lowell Bleachery, their successors and assigns forever, against the lawful claims and demands of all persons.

In witness whereof, I, the said Oliver M. Whipple, together with Sarah K., wife of said Oliver M. Whipple, who joins herein in token of her release of all right and title of to both dower and homestead, in the granted premises, have hereunto set our hands and seals, this twenty-first day of August, in the year eighteen

hundred and sixty-two.

OLIVER M. WHIPPLE. SARAH K. WHIPPLE.

The words "for any and all purposes," being first interlined. Signed, sealed and delivered in presence of

E. B. PATCH.

Middlesex, ss., August 28, 1862.

Then personally appeared the above-named Oliver M. Whipple, and acknowledged the foregoing instrument to be his free act and deed.

Before me,

E. B. PATCH,

Justice of the Peace.

Mr. RICHARDSON. I will, sir, and the "consideration," which my brother desired to know, in the other deeds, and, I presume, will in this, is \$13,500.

Commissioner Russell. I think you did not give it in

the last one.

Mr. Richardson. Yes, sir, \$4,000.

Commissioner Russell. I did not catch it.

Mr. RICHARDSON. Recollect that all these lots were without any building, — without any wheels. The consideration in this is \$13,500. The deed is dated August 21st, 1862. I said that this land was situated precisely as Mr. Wood's, with the canal not yet built down to Mr. Wood's land, and the grant power was, the canal water may be drawn from the canal, but is limited, and "shall not exceed cubic feet per second for eleven and one-quarter hours per day."

All the rest of the provisions were like what were in the other deeds, with a provision that the canal should be extended down to the northerly line of this lot which was

conveyed in this deed.

Mr. Butler. How much land was conveyed?

Mr. Richardson. I will read it. "A certain piece or parcel of land situate in said Lowell, and thus bounded and described: beginning at the southwesterly corner of the premises at a point on the northerly side of Moore street, at a post and at land of said Lowell bleachery; thence easterly along Moore street one hundred and six and five one hundredths feet to a new street to be laid out by the grantor

thirty feet in width."

Eleven hundred and seven feet is the length of one line. We shall have some witnesses to show. The bleachery was incorporated many years ago for the purpose of coloring and bleaching woollen and cotton goods, and owned a large tract of land, described in the petition, adjoining this. went on and put into this land, on the northerly side that the canal was to be constructed, a flume, and they have put in a wheel with capacity enough to use the power, and have put in works by which they could use the power for the purpose of their bleachery and works. While some of those preparations were being made the canal was extended down to the northerly line to meet their flume, and they have used the water as they might from that time to this. They have the means by their flume and wheel of using it for a power, if power might be necessary. They also have a use for it different from what the others do for the purposes of their works, and there will be some evidence of the need of water for that purpose, and the value of water for that purpose, both or either of which measures of damages you will consider in finding upon our loss.

OPENING ARGUMENT OF MOORFIELD STOREY, ESQ.

The next case is C. Brown Snyder, the owner of the Chase mills. The petition begins with a description of his land, and makes the same allegations that the other petitions do substantially. I presume it will not be desirable to read it.

Mr. Butler. No, sir.

Mr. Storey. The description here is the description of the land as it stands. The title to the land is derived under quite a number of deeds; no one of which contains the whole description as it is given here. At the suggestion of General Butler, in order to bring all the parties before the Court, I have had the petition amended, by leave of the Court, by joining in it Amory Leland, Charles H. Allen, Alfred W. Bates, Benjamin E. Bates and C. Brown Snyder, partners, under the firm of Leland, Allen & Bates, who hold two mortgages on the real estate and the water rights. And by joining, also, Peter O. Strang, of New York, as he is surviving trustee under an indenture of trust between said Snyder of the first part, and Strang and Josiah Bardwell of the other part. Mr. Strang holds, as trustee, two mortgages to the amount of \$80,000. He is trustee for the wife and two daughters of Mr. Snyder. Those two papers together constitute the petition.

Mr. Butler. What is the father's conveyance?

Mr. Storey. I will put in the title here in a moment. I suppose the petition and the answers will be printed?

Commissioner Russell. The petition will be printed. I suppose the answer is the same precisely as in the other

cases.

Commissioner Russell (addressing official stenographer). Print the petition and the amendment, and then make a note saying that the answer is the same as the case of Wilder, and is therefore not printed.

COMMONWEALTH OF MASSACHUSETTS.

MIDDLESEX, SS.

To the Sheriffs of our several Counties, or their Deputies,-

GREETING:

We command you to summon the City of Boston, a municipal corporation established under the laws of this Commonwealth, in the County of Suffolk, to appear before the justices of our Superior Court, to be holden at Lowell, within and for our County of Middlesex, on the first Monday of September next, and answer to the petition of C. Brown Snyder, of the City, County and State of New York, filed in the office of the Clerk of the Courts for said County of Middlesex, on the day of the date hereof, a true and attested copy of which petition is hereto annexed.

And have you there this writ with your doings thereon.

Witness, Lincoln F. Brigham, esquire, at Cambridge, this eighteenth day of June, one thousand eight hundred and seventy-five.

THEO. C. HURD, Clerk.

To the Honorable the Justices of the Superior Court within and for the County of Middlesex:—

Respectfully represents your petitioners, C. Brown Snyder, of the City, County and State of New York.

1. That he is now and for more than three years last past has been lawfully seized in fee simple of a parcel of real estate situ-

ated in Lowell in said county, and thus described, viz.: beginning at the westerly corner of the premises, at a stone marked on the easterly face of the easterly bank-wall of Whipple's canal; thence south 301° east thirty-two and forty one-hundreths feet; thence at an angle of 186° 25', still more southerly twenty feet; thence still southerly, at an angle of 191° 9', ten feet; thence still southerly, at an angle of 181° 35', ten feet; thence still southerly, at an angle of 172° 40', ten feet; thence still southerly, at an angle of 170° 10′, ten feet; thence still southerly, at an angle of 141° 10', eleven and five one-hundredths feet; thence still more southerly than said last line, at an angle of 217° 40', nine and onetenth feet; thence westerly, at an angle of 270°, seven feet; thence southerly, at an angle of 89° 44', ninety and eighty-five one-hundredths feet to a stake at said easterly face of said bankwall, all said distances from the point begun at, to said stake, being on the easterly or outside face of said bank-wall; thence from said stake easterly at a right angle ninety-five feet to a marked stone bound at Concord river; thence northerly, on the westerly bank of Concord river, to an iron bolt in the ground in the river, at a point which will be met by extending northerly to the river (in the same direction the line now runs as to course) the easterly boundary-line of a lot of land conveyed by said Whipple to Joshua Mather by deed dated May 18th, 1857; thence southerly fourteen feet to a stake at the northeasterly corner of said Mather lot; thence southerly by said Mather lot eighty-seven feet to a stake at the southeasterly corner of said Mather lot; thence westerly, at an angle of 218° 53', fourteen and twenty-eight onehundredths feet to the point of beginning. Also, of a certain other parcel of real estate, situated in said Lowell, adjoining the foregoing, and thus bounded and described, viz.: beginning at the northerly corner of the premises at the corner of a wall at the junction of Concord river and River Meadow brook; thence southwesterly along the bank of said River Meadow brook to land sold by Oliver M. Whipple to Joshua Mather; thence southeasterly along said Mather land, to land sold by said Whipple to A. H. Chase, and now belonging to said Snyder; thence northeasterly along said petitioner's land to the westerly bank of Concord river; thence northwesterly along the westerly bank of Concord river to the point begun at: containing about eight thousand feet, more or less.

2. That as appurtenant to said real estate he is, and for more than three years last past has been, in full possession and enjoyment of a valuable right, privilege and easement, viz.: the right to take water from the said Concord river, through and by means of the canal now or formerly of one Oliver M. Whipple, lying southerly of the first parcel of real estate hereinbefore described, to an amount not exceeding forty-eight cubic feet per second, for eleven and one-quarter hours per day, for six days of the week, except when the water in said canal is not equal to two hundred and eighty-eight cubic feet per second during the time aforesaid, and then to an amount not exceeding one-sixth of the water flow-

ing through said canal.

3. That your petitioner is, and during the whole of said period has been, the owner of a large mill, fully equipped with expensive machinery used for the manufacture of cloth, situated upon the said real estate, which depends upon the water which your petitioner has the right to draw as aforesaid for its motive-power, and which was erected for the purpose of using the said privilege of taking water, and that the said real estate, mill and machinery,

without said privilege, would be of little or no value.

4. That the amount of water in said canal has always, except in rare instances, occasionally occurring in exceptional seasons, such exceptional periods being of short duration, equalled the amount of two hundred and eighty-eight cubic feet per second for eleven and one-quarter hours per day for six days of the week; and that the amount which your petitioner has been able to draw from said river by virtue of his said privilege was always sufficient for all the requirements of his said mill, until the water of said river was diverted as hereinafter stated, and but for such

diversion would have continued so sufficient.

- 5. That Sudbury river, so called, in said Commonwealth, is one of the natural sources and tributaries of said Concord river, and the waters thereof are the principal means of supply of said Concord river, and that the waters of said Sudbury river, when undisturbed and unobstructed and left to their natural course and current, flow into said Concord river, above said land and mill of your petitioner, and with the waters of said Concord river have been accustomed to and of right ought to flow through the canal aforesaid, and to pass by and through the said land and mill, and furnish the water-power on which said mill and machinery are dependent for their use and value as aforesaid; and your petitioner is entitled to have his said share, viz.: forty-eight cubic feet per second of the waters in said canal, undiminished and unabated; and your petitioner, if deprived of the right to the waters of said Sudbury river flowing as aforesaid, would lose substantially the whole of his said right, privilege and easement in the waters of the said Concord river and in said canal, and the value of his said property, mill and machinery would be greatly reduced.
- 6. That under and by virtue of, in accordance with and for the purpose of an act of the Legislature of the Commonwealth of Massachusetts, passed on the eighth day of April, A.D. 1872, entitled "An Act to authorize the City of Boston to obtain an additional supply of pure water," and by and through the agency ordained by said act, the City of Boston, in the County of Suffolk in said Commonwealth, within three years previous to the filing of this petition took, held and conveyed to and through said city all the waters of said Sudbury river at and above the dam built by the City of Boston in 1872, five hundred feet, more or less, below the crossing of the said Sudbury river by the Boston, Clinton and Fitchburg Railroad, in the town of Framingham, in the County of Middlesex, and near the brook which is the outlet from Farm pond into said river, and all the water in the said dam to the source or sources of said river; also, all the water in Farm pond,

so called, in the said town of Framingham, and all the water in the brook connecting Farm pond with Sudbury river; also, all the water in all streams, brooks and rivulets, or water-courses of any kind, whether natural or artificial, that may flow into or from said Farm pond, and into or from said Sudbury river, at any point or points above said dam, subject to the restrictions set forth in section 4 of chapter 177 of the Laws of 1872, with reference to said water; and the said city took and held the whole right, title and interest in said waters, and has become the sole and absolute owner of the same, subject to the restrictions aforesaid; and by and as a part of the aforesaid taking, the city took and your petitioner has been deprived of substantially the whole of his said right, privilege and easement to take water from said Concord river, and the value of his said property, mill and machinery has been greatly reduced.

7. That said City of Boston, by the authority and agency, and for the purposes hereinbefore set forth, and within three years last past from the day of the date of this petition, first actually withdrew, diverted and obstructed, and has ever since continued and still continues, and intends henceforth to withdraw, divert and obstruct, the waters of said Sudbury river, and said other waters in the sixth paragraph of this petition described, from and in what has always been heretofore, and what would have always been hereafter, their natural and accustomed flow into and through said Concord river, and by, through and over the aforesaid land and mill of your petitioner. All of which past, present and intended withdrawals, diversions and obstructions are against the rights of your petitioner, and have deprived and will henceforth deprive your petitioner of the water-power to which he is entitled as aforesaid, and have greatly diminished and will henceforth greatly diminish or destroy the value of your petitioner's rights in the same, and in said property, mill and machinery.

8. That by reason of said taking of the water of said Sudbury river and the other waters aforesaid, and by reason of said past, present and intended withdrawals, diversions and obstructions, and by reason of all the acts of said City of Boston and its agents, and the matters and things hereinbefore set forth, your petitioner has suffered great damages in his property, and that he has not agreed and has not been able to agree with the said City of Boston upon the damages to be paid therefor, and that said city has not offered to pay him as such damages any sum whatever. Wherefore your petitioners, not waiving any right to take advantage by petition for a writ of certiorari or otherwise of errors and irregularities in the aforesaid acts and proceedings, but expressly reserving the right so to do, prays for the assessment of the damages by him sustained as aforesaid, and for such other relief as your petitioner may be entitled to have in this Court, and for a summons to said City of Boston, conformably to the statutes in such case made and provided.

C. BROWN SNYDER.

SUFFOLK, SS.

Boston, July 16, 1875.

I this day summon the within-named City of Boston to appear and answer at Court, by giving in hand attested copies of this writ, and of the petition annexed, to Charles H. Dennie, Esq., treasurer, and Samuel F. McCleary, Esq., Clerk of said City of Boston.

BENJ. F. BAYLEY,

Deputy Sheriff.

SUPERIOR COURT.

MIDDLESEX, SS.

SEPTEMBER TERM, 1876.

C. B. SNYDER et al. vs. The CITY OF BOSTON.

And now come Amory Leland, Charles H. Allen, Alfred W. Bates, Benjamin E. Bates, and C. Brown Snyder, partners under the firm of Leland, Allen and Bates, and say that they, as said partners, hold two mortgages upon the real estate and mill property and rights belonging to said Snyder, and described in his petition in the above-entitled case, the first made by Alfred H. Chase of Lowell to the Lowell Five Cent Savings Bank, to secure the sum of seven thousand dollars, and subsequently assigned to said firm by the assignees of said mortgage, on which the sum of thirty-five hundred dollars remains unpaid; and the second made by said Chase to Hocum Hosford of said Lowell, to secure the sum of thirty-two thousand five hundred dollars, of which six thousand dollars have been paid, which was subsequently assigned to said firm by the assignees thereof.

And also comes Peter O. Strang, of New York, as he is surviving trustee under an indenture of trust between said C. Brown Snyder of the one part, and said Strang and Josiah Bardwell, late of Boston, deceased, of the other part, and says that, as such trustee, he holds two mortgages upon the estate, mill property, and rights belonging to said Snyder, and described in said petition, the first made by said Alfred H. Chase to Josiah Gates and others, to secure the sum of fifty thousand dollars, and subsequently assigned to said Strang and Bardwell, as said trustees, by the assignees thereof; and the second made by said Snyder to said Strang and Bardwell, as trustees, to secure the payment of thirty

thousand dollars.

And the said Leland, Allen, Alfred W. Bates, Benjamin E. Bates, and C. Brown Snyder, partners as aforesaid, and the said Peter O. Strang, trustee as aforesaid, ask that they may be admitted as parties to said petition of said C. Brown Snyder, and

may be allowed jointly with him to prosecute the claim for damages therein set forth against the said City of Boston.

AMORY LELAND, CHARLES H. ALLEN, ALFRED W. BATES, BENJAMIN E. BATES, C. BROWN SNYDER.

By BROOKS, BALL & STOREY, Their Attorneys.

PETER O. STRANG.

By BROOKS, BALL & STOREY, His Attorneys.

Mr. Storey. The immediate title to this property came from a deed of Oliver B. Coe, dated the 5th day of February, 1872.

This indenture, made the fifth day of February, in the year of our Lord one thousand eight hundred and seventy-two, between Oliver B. Coe and Annie I., his wife, of the City of Boston, in the county of Suffolk, and Commonwealth of Massachusetts, parties of the first part, and C. Brown Snyder, of Spuyten Duyvel, in the county of Westchester, and State of New York, party of the second part, witnesseth, that the said parties of the first part, for and in consideration of the sum of six hundred dollars, lawful money of the United States of America, to them in hand paid by the said party of the second part, at or before the ensealing and delivery of these presents, the receipt whereof is hereby acknowledged, have remised, released, and quitclaimed, and by these presents do remise, release, and quitclaim unto the said party of the second part, and to his heirs and assigns, forever, all that certain real estate lying and being situated in the City of Lowell, in the County of Middlesex, and Commonwealth of Massachusetts, and known as the Chase Mills, which was conveyed to me by Alfred H. Chase and Helen F., his wife, by quitclaim deed, dated February 9th, 1871, and recorded in Middlesex Northern District Registry of Deeds, February 10th, 1871, book 77, page 527, in which said deed reference is made, for further description of the property thereby conveyed, to the following deeds: Deed of Oliver M. Whipple to said Chase, dated February 20th, 1863, and recorded in Middlesex Northern Registry of Deeds, February 21st, 1863, book 33, page 184; also deed of Hocum Hosford, dated March 5th, 1866, to said Chase, and recorded in said Registry of Deeds, March 13th, 1866, book 47, page 244. Also, for further description reference is made to deed of said Chase to said Hosford, dated December 1st, 1863, and recorded in said Registry of Deeds, December 29th, 1863, book 36, page 364. Reference is also made for further description to six deeds to said Chase and Hosford, as follows: Deed by Ephraim B. Patch, dated February 29th, 1864,

recorded in said Registry of Deeds, March 1st, 1864, book 36, page 544; deed by E. B. Patch, dated February 10th, 1865, and recorded in said Registry of Deeds, February 11th, 1865, book 41, pages 7 and 8; deed by L. W. Faulkner, dated February 29th, 1864, and recorded in said Registry of Deeds, August 13th, 1864, book 40, page 78; deed from Luther Richards, dated February 20th, 1865, and recorded in said Registry of Deeds, February 21st, 1865, book 41, page 120; deed from John Rothwell, dated December 11th, 1863, and recorded in said Registry of Deeds, December 29th, 1863, book 36, page 369; deed from Joseph Ball, dated December 9th, 1863, and recorded in said Registry of December 9th, 1863, book 36, page 293. Meaning hereby to convey, and I do hereby convey, unto the said Snyder, all that factory estate known as the Chase Mills, with all the privileges, water-rights, easements, and appurtenances thereto belonging, and all machinery, fixtures, and tools on said premises and connected therewith, the said factory estate being situated in said Lowell. These said premises are subject, as to the whole or a part thereof, to the following-named mortgages, viz.: Mortgage deed from said Alfred H. Chase to the Lowell Five Cent Savings Bank, of Lowell, dated February 20th, 1863, and recorded in Middlesex Northern District Registry of Deeds, February 21, 1863, book 33, page 189; also a mortgage deed from said Chase to Hocum Hosford, of Lowell, dated March 5th, 1866, and recorded in said Registry of Deeds, March 13th, 1866, book 47, page 246; also a mortgage deed from said Chase to said Hosford, dated March 12th, 1866, and recorded in said Registry of Deeds, March 13th, 1866, in book 47, page 248; also a mortgage deed from said Chase to said Hosford, dated April 17th, 1866, and recorded in said Registry of Deeds, April 20th, 1866, in book 48, page 242; also a mortgage deed from said Chase to Josiah Gates, Horace J. Adams, William H. Wiggin, and Charles P. Talbot, all of Lowell, and Thomas Talbot, of Billerica, dated February 1st, 1867, and recorded in said Registry of deeds, February 2d, 1867, book 54, page 266; also a mortgage deed from said Chase to Peter O. Strang, of New York, dated June 13th, 1867, recorded in said Registry of Deeds, June 13th, 1867, book 57, page 201.

Together with all and singular the tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining, and the reversion and reversions, remainder and remainders, rents, issues and profits thereof. And also, all the estate, right, title, interest, homestead rights, dower, and rights of dower, property, possession, claim and demand whatsoever, as well in law as in equity, of the said parties of the first part, of, in or to the above-described premises, and every part and parcel thereof, with the appurtenances. To have and to hold all and singular the above mentioned and described premises, together with the appurtenances, unto the said party of the second part, his heirs, and

assigns forever.

In witness whereof, the said parties of the first part have here-

unto set their hands and seals, the day and year first above written.

OLIVER B. COE. ANNIE I. COE.

Sealed and delivered in presence of

CHAS. H. ALLEN,
As to O. B. C.
WILL. HOLMES.

STATE OF MASSACHUSETTS, COUNTY OF SUFFOLK, SS.

On this eighth day of February, in the year of our Lord one thousand eight hundred and seventy-two, before me personally came Oliver B. Coe and Annie I. Coe, to me known to be the individuals described in, and who executed the within conveyance, who have acknowledged that they executed the same.

WM. M. BUNTON,

Justice of the Peace.

Mr. Storey. Then there is a deed of Alfred H. Chase to Coe, dated February 9th, 1871, which conveys the property which is described in the petition.

Know all men by these Presents, That I, Alfred H. Chase, of Lowell, in the County of Middlesex, and Commonwealth of Massachusetts, in consideration of six hundred dollars, paid by Oliver B. Coe, of the City of Boston, in the County of Suffolk, and Commonwealth of Massachusetts, the receipt whereof which is hereby acknowledged, do hereby remise, release, and forever quitclaim unto the said Coe, his heirs and assigns, all the real estate situated in said Lowell which was conveyed to me by and described in the deeds of Oliver M. Whipple, dated February 20th, 1863, and recorded in Middlesex Northern District Registry of Deeds, February 21st, 1863, book 33, page 184. Also all the estate whereof one undivided half was conveyed to me by deed of Hocum Hosford, dated March 5th, 1866, and recorded in said Registry of Deeds, March 13th, 1866, book 47, page 254, the other undivided half of which was, previously to said last-named deed, owned by me in common with said Hosford, and the title to which is cited in his said deed to me; also all the estate of which one undivided half was by me conveyed to said Hosford by deed dated December 1st, 1863, and recorded in said Registry of Deeds December 29th, 1863, in book 36, page 364, as well as that purchased by said Hosford and myself together, by deeds, from Ephraim B. Patch, dated February 29th, A. D. 1864, recorded in said Registry March 1st, 1864, book 36, page 544; deed from Ephraim B. Patch, dated February 10th, 1865, and recorded in said Registry February 11th, 1865, book 41, pages 7 and 8; deed from L. W. Faulkner, dated February 29th, 1864, and recorded in said Registry August 13th, 1864, book 40, page 78; deed from Luther Richards, dated Febrnary 20th, 1865, and recorded in said Registry February 21st,

1865, in book 41, page 120; deed from John Rothwell, dated December 11th, 1863, and recorded in said Registry December 29th, 1863, book 36, page 369; deed from Joseph Ball, dated December 9th, 1863, and recorded in said Registry December 9th, 1863, book 36, page 293. Meaning hereby to convey, and I do hereby convey, unto the said Coe all my factory estate known as the "Chase Mills," with all the privileges, water-rights, easements, and appurtenances thereto belonging, and all machinery, fixtures, and tools on said premises and connected therewith, the said fac-

tory estate being situated in said Lowell.

The said premises are subject as to the whole or a part thereof to the following-named mortgages, viz.: Mortgage deed from me to the Lowell Five Cents Savings Bank of Lowell, dated February 20th, 1863, and recorded in Middlesex Northern District Registry of Deeds February 21st, 1863, in book 33, page 189; also a mortgage deed from me to Hocum Hosford of Lowell, dated March 5th, 1866, and recorded in said Registry March 13, 1866, in book 47, page 246; also a mortgage deed from me to Hocum Hosford aforesaid, dated March 12th, 1866, and recorded in said Registry of Deeds March 13th, 1866, in book 47, page 248; also a mortgage deed from me to said Hocum Hosford, dated April 17th, 1866, and recorded in said Registry April 20th, 1866, in book 48, page 242; also a mortgage deed from me to Josiah Gates, Horace J. Adams, William H. Wiggin, and Charles P. Talbot, all of Lowell, and Thomas Talbot of Billerica, dated February 1st, 1867, and recorded in said Registry February 2d, 1867, in book 54, page 266; also a mortgage deed from me to Peter O. Strang of New York, dated June 13th, 1867, and recorded in said Registry of Deeds June 13th, 1867, in book 57, page 201. Also these premises are subject to a lease from me to Messrs. Strang, Platt & Co. of New York, dated March 12th, 1868.

To have and to hold the granted premises, with all the privileges and appurtenances thereto belonging, to the said Oliver B. Coe and his heirs and assigns, to their own use and behoof forever.

And I do hereby, for myself and my heirs, executors, and administrators, covenant with the said grantee and his heirs and assigns that the granted premises are free from all incumbrances made or suffered by me, except the six mortgages and one lease referred to aforesaid; and that I will and my heirs, executors and administrators shall warrant and defend the same to the said grantee and his heirs and assigns forever against the lawful claims and demands of all persons claiming by, through, or under me except as aforesaid, but against none other. And for the consideration aforesaid, I, Helen F. Chase, wife of Alfred H. Chase aforesaid, do hereby release unto the said grantee, and his heirs and assigns, all right of or to both dower and homestead in the granted premises.

In witness whereof we, the said Alfred H. Chase and Helen F. Chase, have hereunto set our hands and seals and affixed and cancelled the stamp required by law, this 9th day of February, in the

year one thousand eight hundred and seventy-one.

ALFRED H. CHASE. HELEN F. CHASE.

Signed in presence of

FRANCIS C. CROSS to A. H. C. SUSAN WHEELOCK to H. F. C.

The words "right, title, and interest in and to," "all that certain," were erased before signing; also the word "title" in the eighteenth line from top was interlined before signing.

COMMONWEALTH OF MASSACHUSETTS.

MIDDLESEX, SS.

Feb. 10, 1871.

Then personally appeared the above-named Alfred H. and Helen F. Chase, and acknowledged the foregoing instrument to be their free act and deed. Before me,

JOHN F. MANAHAN, Justice of the Peace.

Mr. Storey. The original deeds which describe our water-rights are two: one the deed of Oliver M. Whipple to Alfred H. Chase, dated 20th February, 1863, and the other a deed from Ephraim B. Patch to Hocum Hosford and Alfred H. Chase, dated February 29, 1864.

Know all men by these Presents, That I, Oliver M. Whipple, of Lowell, in the County of Middlesex, and Commonwealth of Massachusetts, in consideration of fourteen thousand dollars to me paid by Alfred H. Chase, of said Lowell, the receipt whereof is hereby acknowledged, do hereby give, grant, bargain, sell and convey unto the said Alfred H. Chase, his heirs and assigns, a certain parcel of land, situate in said Lowell, on Concord river, and thus described, viz.: "beginning at the westerly corner of the premises at a stone marked on the easterly face of the easterly bank-wall of Whipple's canal, thence S. 302 degrees, E. thirtytwo 40-100 feet; thence at an angle of 186 degrees and twenty-five min.; still more southerly twenty feet; thence still southerly at an angle of 191 deg. 9 min., ten feet; thence still southerly at an angle of 181 deg., 35 min., ten feet; thence still southerly at an angle of 172 deg. 40 min., ten feet; thence still southerly at an angle of 170 deg. 10 min. ten feet; thence still southerly at an angle of 141 deg. 10 min., eleven and 5-100 feet; thence still more southerly than said last line at an angle of 217 deg. 40 min., nine and 1-10 feet; thence westerly at an angle of 270 deg., seven feet; thence southerly at an angle of 89 deg. 44 min., ninety and 85-100 feet to a stake at said easterly face of said bank wall; all said distances from the point begun at to said stake, being on the easterly or outside face of said bank wall; thence from said stake easterly at a right angle ninety-five feet to a marked stone bound at Concord river; thence northerly on the westerly bank of Concord river to an iron bolt in the ground in the river, at a point which will be met by extending northerly to the river (in the same direction the line now runs as to course), the easterly boundary line of a lot of land conveyed by said Whippie to Joshua Mather, by deed dated May 18, 1857; thence southerly fourteen feet to a stake at the northeasterly corner of said Mather lot; thence southerly by said Mather lot eightyseven feet to a stake at the southeasterly corner of said Mather lot; thence westerly at an angle of 218 deg. 53 min., fourteen and 28-100 feet, to the point of beginning.

Also the right, privilege and easement to take water by means of the canal of the grantor lying southerly of the premises, and leading out of Concord river, and by means of head raceways to enter the said canal at any points opposite the premises, and to conduct the water to the premises to be used thereon, the same to be done in such a manner as in no wise to injure or weaken the banks of said canal or interrupt the flow of water therein. Also, the right for said water to enter said canal from the said Concord river to the extent hereinafter specified, and the right forever hereafter to have said canal and the banks thereof and the permanent dam owned by the grantor across Concord river continued for the purpose of affording a water-power, and to the extent and with the exceptions and reservations hereinafter contained and set forth. The quantity of water which may be drawn from the canal by the grantee, his heirs and assigns, is strictly limited to and shall not exceed thirty-six cubic feet per second for eleven and one-quarter hours per day of six days of the week. And if, at any time, the quantity of water in the canal shall not equal two hundred and eighty-eight cubic feet per second during the time aforesaid, then the grantee, his heirs and assigns, shall, during such time, be restricted to one-eighth of the quantity of water in the canal. Meaning that the quantity of water which may be drawn from the canal by the grantee, his heirs and assigns, shall never, at any time, exceed thirty-six cubic feet per second, for the above-specified time, however great may be the supply of water from the said canal, and that the quantity of water which may be taken by the grantee, his heirs or assigns, shall be restricted to such an amount less than thirty-six cubic feet per second during the above-specified time as shall be equal to one-eighth of the supply afforded from the canal, whenever the water in the canal shall be less than two hundred and eighty-eight cubic feet per second for eleven and one-quarter hours per day for six days of the week.

Also, the right to pass with cars over the railroad leading from the Boston & Lowell, and Lowell & Lawrence Railroads at Whipple's station to the above-described premises, and over the premises of the grantor as the railroad is now constructed, or as it may be constructed hereafter by the grantee, or by the proprietors of the several rights or grants now made, or which may be made by the grantor, his heirs or assigns. But this right is to be used in common with other grants made by the grantor, or which may be made, and in common with the grantor, his heirs and assigns. Nor shall he or they be under any obligation to maintain said railroad or to extend the same; meaning only to grant the right to use in common with others the present railroad track, so long as the same may continue, with a right of rebuilding a track, and using and maintaining the same as aforesaid, and subject to the rights of the Boston & Lowell, Lowell & Lawrence, and Salem & Lowell Railroad Companies, and subject to such changes in the direction or situation of the track as the grantor, his heirs or assigns, may reasonably demand. And in case said railroad shall be discontinued the grantee, his heirs and assigns, shall have, so long as the railroad shall be discontinued, a right of way to pass and repass with teams from Lawrence street to the conveyed premises over the space on the northeasterly side of the canal, between said canal and conveyed lots, which space is now owned by said Whipple, but so as not to obstruct said space to the injury of said grantor, his heirs and assigns. Also, the right to lay and maintain a railroad track on the bank of the canal, between the conveyed premises and the canal, and to use the same in common with the grantor, his heirs and assigns. Also, a convenient way not less than thirty feet wide, from Lawrence street to the premises herein conveyed, to be located by said Whipple, and which with a bridge of suitable width and construction over the canal is, including the bridge to be made and maintained by said Whipple, his

heirs and assigns, for the common use of said grantor and grantee, and

their heirs and assigns.

And said grantor reserves to himself, his heirs and assigns, the right to lay and use in the edge of the river outside of the bank a tail-race along the line of the conveyed premises, but so as not to interrupt the convenient flow of water from said premises into said river, and the said grantee, his heirs and assigns, shall not by reason of abutting on said river or owning said premises, have the right to have the water from above in Concord river flow in said river past said premises, but said Whipple, his heirs and assigns, retain forever the right to dam said river above said premises, and to divert the water thereof into and along his said canal for the privilege herein conveyed, and for other privileges established and to be established. And the said grantee, his heirs and assigns, shall have the right to discharge the water from the conveyed premises into Concord river without obstruction, and the right to construct buildings on piles or posts over the edge of said river, but not to extend more than twenty-five feet from said bank of said river and only along his said premises, but so as not unreasonably to obstruct the flow of water in said river or tail-race.

And the grantor, for himself, his heirs and assigns, covenants with the grantee, his heirs and assigns, that he will within seven months from this date so enlarge the said canal that the same shall be of sufficient capacity at all times, when the water in the river and canal is as high as the top of the said permanent dam in Concord river, to carry and discharge not less than two hundred and eighty-eight cubic feet per second, of eleven and one-quarter hours per day, of six days of the week, without the water therein at the head of the head raceways of the grantee being drawn down more than six inches below the top of said

permanent dam.

And the said Whipple, for himself, his heirs and assigns, further covenants that he will forever hereafter keep and maintain in suitable and proper condition and repair the said canal, enlarged to the capacity aforesaid, and the banks and parts and appurtenances thereof; also said permanent dam and the eight-inch flash-boards as they are usually kept thereon, subject to such reasonable and temporary interruptions and hindrances as may be necessary in such maintenance and repairs. This deed is on the express reservation to the grantor, his heirs and assigns, of the annual sum of fifteen dollars, to be forever hereafter yielded and paid by the grantee, his heirs and assigns, for such maintenance and repairs. And this deed is also on the express condition that for affording reasonable facilities for measuring water taken from the canal by the grantee, his heirs and assigns, the head raceway of the grantee shall consist in whole or in part of a flume or flumes which shall not be less than fifteen feet in length, with the sides and bottom smooth. And the grantor, his heirs and assigns, may at any and all times hereafter enter upon the said premises of the grantee, and make such admeasurements as may be requisite and proper for determining the quantity of water taken, and also for the purpose, from time to time, of repairing the wall and bank of the canal.

To have and to hold the said conveyed premises, with the privileges and appurtenances to the same belonging to the said Chase, his heirs and assigns, in fee simple forever. And I, the said Whipple, for myself, my heirs, executors and administrators, do covenant with said Chase, his heirs and assigns, that I am lawfully seized in fee simple, of the aforegranted premises; that they are free from all encumbrances; that I have good right to sell and convey the same to said Chase, his heirs and assigns forever, as aforesaid; and that I will and my heirs executors and administrators shall warrant and defend the same to the said Chase, his heirs and assigns, forever against the lawful claims and

demands of all persons.

In witness whereof, we, the said Oliver M. Whipple and Sarah K., his wife, in token of her release of all claim to dower and homestead exemption in the premises, have hereunto set our hands and seals this twentieth day of February, in the year eighteen hundred and sixty-three.

OLIVER M. WHIPPLE, SARAH K. WHIPPLE.

Signed, sealed and delivered in the presence of

DANIEL S. RICHARDSON, GEORGE F. RICHARDSON, MARGARET A. WHIPPLE.

Three interlineations made before execution, and above the words "to the same belonging."

COMMONWEALTH OF MASSACHUSETTS.

MIDDLESEX, SS.

February 20, 1863.

Personally appeared Oliver M. Whipple, and acknowledged the above instrument by him subscribed to be his free act and deed.

Before me,

DANIEL S. RICHARDSON,

Justice of the Peace.

Know all men by these Presents, that I, Ephraim B. Patch, of Lowell, in the County of Middlesex and Commonwealth of Massachusetts, in consideration of five thousand dollars, paid to me by Hocum Hosford and Alfred H. Chase, both of said Lowell, the receipt whereof is hereby acknowledged, do hereby convey, remise, release and forever quitclaim unto the said Hosford and Chase, their heirs and assigns forever, a certain piece or parcel of land, situate in said Lowell, thus bounded and described, viz.: beginning at the northerly corner of the premises at the corner of a wall at the junction of Concord river and River Meadow brook; thence southwesterly along the bank of said River Meadow brook to land sold by Oliver M. Whipple to Joshua Mather; thence southeasterly along said Mather land to land sold by said Whipple to said Chase, and now belonging to said Chase, and Hosford; thence northeasterly along said grantee's land to the westerly bank of Concord river; thence northwesterly along the westerly bank of Concord river to the point begun at: containing about eight thousand feet, more or less.

And the said grantor reserves to himself, his heirs and assigns, the right to lay and use in the edge of said Concord river outside of the bank a tail-race along the line of the conveyed premises; and the said grantees, their heirs and assigns, shall not, by reason of abutting on said river or owning said premises, have the right to have the water from above in Concord river flow in said river past said premises, but said Patch, his heirs and assigns, retain forever the right to dam said river above said premises, and to divert the water thereof into and along the canal of the grantor, for water privileges now sold or established, or which may be hereafter sold or established.

And the said grantor, his heirs and assigns, reserve forever the right for the water in River Meadow brook to flow in and through said River Meadow brook along the line of the conveyed premises as it now flows or may flow by the discharge of additional water from said canal; and said grantees, their heirs and assigns, shall in no way obstruct the

free flow of water in said brook or in Concord river.

Also the right, privilege and easement to take water by means of the canal of the grantor lying southerly of the premises conveyed by Oliver M. Whipple to Chase by deed dated the twentieth day of February, 1863, and recorded in the northern district of Middlesex Registry of Deeds, February 21, 1863, book 33, page 184, and leading out of Concord river, and by means of head raceways to enter the said canal at any points opposite the premises so conveyed by said Whipple to said Chase, which said premises now belong to said Hosford and Chase, and to conduct the water to said premises of said grantees to be used thereon, the same to be done in such a manner as in no wise to injure or weaken the banks of said canal or interrupt the flow of water therein, Also, the right for said water to enter said canal from the said Concord river to the extent hereinafter specified, and the right forever hereafter to have said canal and the banks thereof, and the permanent dam owned by the grantor across Concord river continued for the purpose of affording a water-power and to the extent and with the exceptions and reservations herein contained and set forth. The quantity of water which may be drawn from the canal by the grantees, their heirs and assigns, by virtue of this conveyance, is strictly limited to and shall not exceed twelve cubic feet per second for eleven and one quarter hours per day of six days of the week. And if at any time the quantity of water in the canal shall not equal two hundred and eighty-eight cubic feet per second during the time aforesaid, then the grantees, their heirs and assigns, shall during such time be restricted to one twenty-fourth of the quantity of water in the canal; meaning that the quantity of water which may be drawn from the canal by the grantees, their heirs and assigns, by virtue of this conveyance, shall never at any time exceed twelve cubic feet per second for the above-specified time, however great may be the supply of water from the said canal, and that the quantity of water which may be taken by the grantees, their heirs and assigns, by virtue of this conveyance, shall be restricted to such an amount less than twelve cubic feet per second during the above-specified time as shall be equal to one twenty-fourth of the supply afforded from the canal whenever the water in the canal shall be less than two hundred and eighty-eight cubic feet per second, for eleven and one quarter hours per day, for six days of the week. The said grantees, their heirs and assigns, shall have the right to discharge said water over their own premises into Concord river, without obstruction, but so as not unreasonably to obstruct the flow of water in said river.

And the grantor, for himself, his heirs and assigns, covenants with the grantecs, their heirs and assigns, that he will, within seven months from this date, so enlarge the said canal that the same shall be of sufficient capacity at all times, when the water in the river and canal is as high as the top of the said permanent dam in Concord river, to carry and discharge not less than two hundred and eighty-eight cubic feet per second, of eleven and one-quarter hours per day, of six days of the week, without the water therein at the head of the head raceways of the grantees being drawn down more than six inches below the top

of said permanent dam.

And the said Patch, for himself, his heirs and assigns, further covenants that he will forever hereafter keep and maintain in suitable and proper condition and repair the said canal enlarged to the capacity aforesaid, and the banks, and parts, and appurtenances thereof; also, said permanent dam and the eight-inch flash-boards as they are usually kept thereon, subject to such reasonable and temporary interruptions and hindrances as may be necessary in such maintenance and repairs. This deed is on the express reservation to the grantor, his heirs and assigns, of the annual sum of five dollars, to be forever hereafter yielded and paid by the grantees, their heirs and assigns, for such maintenance and repairs. And this deed is on the express condition

that for affording reasonable facilities for measuring water taken from the canal by the grantees, their heirs and assigns, by virtue of this conveyance, the head raceway of the grantees shall consist in whole or in part of a flume or flumes which shall not be less than fifteen feet in length with the sides and bottom smooth. And said grantor, his heirs and assigns, may at any and all times hereafter enter upon said premises, so sold by said Whipple to said Chase, and now belonging to said grantees, and make such admeasurements as may be requisite

and proper for determining the quantity of water taken.

And I, Oliver M. Whipple, of said Lowell, at the request of said Patch, and by reason of consideration aforesaid, do hereby release and forever discharge the above-described premises, but none other, from a certain mortgage given me by said Patch, dated the twentieth day of March, A.D. 1863, and which covers a piece of land and water-power which include the above-described premises, and I do hereby relinquish, convey and release unto the said grantees, their heirs and assigns, all the right, title and interest, which I have by virtue of said mortgage in and to the above-described premises, but none, other so that the said grantees, their heirs and assigns, may forever hold and enjoy the above-described premises free and unincumbered by said mortgage, and for this purpose and for this purpose only, I hereby join in this deed, my object and purpose being to release from said mortgage the above-described premises without prejudice to my rights under said mortgage to the remaining land and water-power embraced therein.

To have and to hold the above-conveyed premises with all the privileges and appurtenances to the same belonging to the said Hosford and Chase, their heirs and assigns, to their use and behoof forever, and I, the said Ephraim B. Patch, for myself and my heirs, executors and administrators, do covenant with the said Hosford and Chase, their heirs and assigns, that the premises are free from all incumbrances made or suffered by me, and that I will, and my heirs, executors and administrators shall, warrant and defend the same to the said Hosford and Chase, their heirs and assigns, forever against the lawful claims and demands of all persons claiming by, through or under me, but against

In witness whereof, we, the said Ephraim B. Patch and Oliver M. Whipple, have hereunto set our hands and seals this twenty-ninth day of February, in the year eighteen hundred and sixty-four.

> E. B. PATCH. [SEAL.] OLIVER M. WHIPPLE. [SEAL.]

Signed, sealed and delivered in presence of GEORGE F. RICHARDSON.

MIDDLESEX, SS., March 1st, 1864.

Then personally appeared the above-named E. B. Patch and Oliver M. Whipple, and severally acknowledged the foregoing instrument to be their free act and deed.

Before me,

GEORGE F. RICHARDSON, Justice of the Peace.

Mr. Storey. I have also five separate deeds from five distinct parties, from whom Messrs. Hosford and Chase jointly got various parcels of land which have been added to the land upon which this mill now stands, and help to

Deed. 609

make up the land described in the petition. As the answer admits, substantially, the ownership of the land, and merely puts in question our title to the water-power, I presume it is not necessary to trouble the Commissioners with any reference to those deeds—those little outside pieces of land. Then there is a deed from Hosford to Chase, conveying his undivided half, which is conveyed on the 5th of March, 1866.

Know all men by these Presents, That I, Hocum Hosford, of Lowell, in the County of Middlesex, and Commonwealth of Massachusetts, in consideration of forty-seven thousand five hundred dollars, paid by Alfred H. Chase, of said Lowell, the receipt whereof is hereby acknowledged, do hereby remise, release and forever quitclaim unto the said Chase, his heirs and assigns, my undivided half of all the real estate, easements and privileges described in a deed thereof from said Chase to me dated December 1, 1863, and recorded in Middlesex Registry of Deeds, Northern District, December 29, 1863, book 36, page 364, subject to the provisions, reservations, and conditions in said deed contained, intending hereby to reconvey to said Chase all the real estate, rights, privileges, and easements conveyed to me by said Chase by said deed, including my undivided half of all the fixtures situate in or connected with the mill upon the premises. Said real estate is situate in said Lowell, and for further description reference is made to said deed and deeds therein referred to.

Also, my undivided half of all the real estate situate in said Lowell, and of all the rights, privileges, and easements (subject to the provisions in the deeds hereinafter mentioned contained) which were conveyed to the said Hosford and Chase by the following deeds from the following persons: Deed from Ephraim B. Patch, dated February 29, A. D. 1864, recorded in said Registry March 1, 1864, book 36, page 544. Deed from Ephraim B. Patch, dated February 10, 1865, and recorded in said Registry, February 11, 1865, book 41, pages 7 and 8. Deed from L. W. Faulkner, dated February 29, 1864, and recorded in said Registry, August 13, 1864, book 40, page 78. Deed from Luther Richards, dated February 20, 1865, and recorded in said Registry, February 21, 1865, book 41, page 120. Deed from John Rothwell, dated December 11, 1863, and recorded in said Registry December 29, 1863, book 36, page 329. Deed from Joseph Ball, dated December 9, 1863, and recorded in said Registry December 9, 1863, book 36, page 293. Including all my interest in the machinery on the premises.

To have and to hold the above-released premises, with all the privileges and appurtenances to the same belonging, to the said Chase, his heirs and assigns, to his and their use and behoof forever.

And I, the said Hosford, for myself and my heirs, executors, and administrators, do covenant with the said Chase, his heirs and assigns, that the premises are free from all incumbrances, made or suffered by me, except of certain easements conveyed by said Chase and myself to L. W. Faulkner.

And that I will, and my heirs, executors, and administrators shall, warrant and defend the same to the said Chase, his heirs and assigns forever, against the lawful claims and demands of all persons, claiming by, through, or under me, except as aforesaid,

but against none other.

In witness whereof, I, the said Hocum Hosford and Rebecca T., wife of said Hosford, in token of her release of all right and title of or to both dower and homestead in the granted premises, have hereunto set our hands and seals, this fifth day of March, in the year of our Lord eighteen hundred and sixty-six.

H. HOSFORD, REBECCA T. HOSFORD.

Signed, sealed and delivered, in the presence of

GEORGE F. RICHARDSON.

Witness to H. H.

A. G. POLLARD.

Witness to R. T. H.

MIDDLESEX, SS.

March 12, 1866.

Then personally appeared the within-named Hocum Hosford, and acknowledged the foregoing instrument to be his free act and deed. Before me,

GEORGE F. RICHARDSON,

Justice of the Peace.

Mr. Storey. I might, perhaps, explain that Chase, at one time, conveyed to Hosford an undivided half of the property described in the deed of Whipple to Chase and Hosford subsequently re-conveyed it to him, so that those two deeds will cancel each other. I have not thought it worth while to allude to them. But the deeds which describe our property, so far as the water-rights are concerned, are the two deeds — of Whipple to Chase and Patch to Hosford and Chase. The deed of Oliver M. Whipple to Chase conveys to us, on the same terms as in the other deeds which have been read, 36 cubic feet of water per second.

Mr. Butler. What is the consideration? Mr. Storey. The consideration is \$14,000.

Commissioner Russell. That is Whipple to Chase, February 20, 1863?

Mr. Storey. Yes, sir.

Commissioner Russell. And \$14,000 the amount?

Mr. Storey. Thirty-six feet of water.

Commissioner Russell. Perhaps it may be well to print that deed; that, and the next.

Mr. Storey. The next deed, the deed of Ephraim B. Patch, is a deed to Hosford and Chase. In consideration of

\$5,000, conveys a certain parcel of land, which is described, and also the right to take 12 cubic feet of water per second under the same terms and conditions which are contained in the other deeds. The first was 36 and the other 12, making 48 cubic feet of water per second, which we are entitled to draw. Under these two deeds, we claim that we have the right to draw 48 cubic feet of water per second. Those two deeds describe the extent and character of our rights to the water, and if it is desired to have the deeds which make the chain, they can be procured.

Mr. Butler. I do, because there has been so much conveyancing back and forth, I want to see who has got the

title.

Mr. Storey. Well, there are deeds referred to; I have not got a copy of it, but there is a deed from Chase to Hosford of an undivided half of the property described in the first deed. Then, there is a reconveyance back to him; I have got the reconveyance, but not the original conveyance. Hosford, in his reconveyance to Chase, says that he conveys to Chase "my undivided half of all the real estate, easements and privileges described in a deed thereof from said Chase to me, dated December 1, 1863, and recorded in Middlesex Registry of Deeds, Northern District, December 29, 1863, B. 36, page 364, subject to the provisions, reservations, and conditions in said deed contained, intending hereby to reconvey to said Chase all the real estate, rights, privileges and easements conveyed to me by said Chase by said deed, including my undivided half of all the fixtures situate on or connected with the mill upon the premises. Said real estate is situate in said Lowell, and for further description, reference is made to said deed and deeds therein referred to. Also, my undivided half of all the real estate situate in said Lowell, and of all the rights, privileges, and easements (subject to the provisions in the deeds hereinafter mentioned contained) which were conveyed to the said Hosford and Chase." Now, it is necessary, in order to show precisely what this conveyance applied to, to have a copy of the deed from Chase to Hosford.

Mr. BUTLER. Will you get that? Mr. STOREY. Yes, I will get it.

Commissioner Russell. Do you care to have those

printed, General?

Mr. Storey. In order to get at precisely what the deeds of Chase to Coe and Coe to Snyder cover, it is necessary to have those deeds all printed. The description of the waterpower is contained in the two deeds of Whipple to Chase and Patch to Chase and Hosford. I don't care anything

about the outside land. If I put in those two deeds, and those of Hosford to Chase, and Chase to Coe, and Coe to Snyder, will that do?

Mr. Butler. I think those will do.

Mr. Storey. The mill which is erected on this property is a mill that was established for the manufacture of cloths, tailor's cloths, cassimeres, and other goods of that sort. I understand that the machinery which is used for the manufacture of those goods requires more power than the machinery which is used for the manufacture of flannels; there are other machines necessary to complete the process, which require a good deal of power. There are, of such

machinery, ten sets in the mill now.

The mill was originally built so that it could accommodate fourteen sets, and fifteen, by crowding. The additional sets have never been put in. Business has never been such as to warrant it. These deeds and the description of the property show exactly what our rights are. We are affected by the taking precisely as the other parties on the same dam are affected, and very much of the same evidence will apply to every case. We expect to show that, while we have the right to take forty-eight cubic feet of water a second, whenever the water in the river furnishes 288 cubic feet a second or more, for a very considerable portion of the year, we need the water derived from the Sudbury river to make up the number of cubic feet per second which we are entitled to; that by the diversion of the water of the Sudbury river we lose a certain proportion of the power which we are entitled to under our deeds, and which is necessary to run our mill, and we shall ask you to say what the value of that power is as the measure of our damages. And we shall ask you to measure the extent of our damages by what it will cost us to replace it, in other words, by the cost per horse-power of the steam which we should be obliged to manufacture and use to take the place of the power which is taken. The evidence will show in regard to that, I suppose. It is not necessary to state here precisely the evidence, how much water we have, nor how much water we lose.

Mr. Shattuck. I would like to state one thing. It was stated at the view, inadvertently no doubt, but it may be material, it was stated there that the City of Boston purchased the surplus water. I think they have no interest in

the surplus.

TESTIMONY OF JOSEPH B. FRIZELL.

Joseph B. Frizell sworn for the petitioners (in the Wilder case).

Q. (By Mr. Shattuck.) What is your business?

A. I am a civil engineer.

Q. How long have you been so.

A. About twenty years.

Q. To what branch of engineering have you been devoted?

A. Mostly to hydraulic engineering, dealing with water in one way and another.

Q. What is the surface from which evaporation takes place above the Talbot dam, below the junction of the Sudbury river?

A. I find the area of meadows and water surface together, 4,685 acres; that is, between the dam at Middlesex and the dam at Saxonville.

Q. What do you estimate the evaporation per day, and using the four months from the first of May to the first of September?

A. It is thought by civil engineers, it appears very reasonable, that the evaporation from a meadow or marsh is about the same as from water surface; taking that, and the experiments that have been made on evaporation, we find it to be about 41 cubic feet per second, on that surface, during the months of May, June, July and August.

Commissioner Russell. The evaporation from May 1st to September 1st, is about 40 cubic feet per second, on this amount of

surface?

A. Yes, sir.Q. That does not include the part between the Talbot dam and the Wamesit.

A. No, sir.

Q. The area that you refer to is between the Saxonville dam to the Talbot dam?

A. Yes, sir.

Q. And does not include the part below the Talbot dam?

Commissioner Russell. Does not include the water from the Wamesit dam to the Talbot dam?

Q. Have you examined the Concord river at the Middlesex dam?

A. Yes, sir: I have viewed the condition of things there.

Q. How much water is called for by the wheels of the Middle-

sex mill; have you made an examination of that?

A. I assisted in a computation of measurements intended to ascertain that quantity, the quantity called for by the existing deeds on the Middlesex mills?

Q. Yes, used.A. Drawn from the Concord river.

Q. Drawn from the Concord river?

A. It would not exceed 167 or 168 cubic feet per second.

Q. What is the amount of water called for by the Belvidere mill, the Stott mill which takes the water from the same dam?

A. They have a wheel there capable of discharging about 80 cubic feet per second.

Q. A wheel capable of discharging 80 cubic feet per second.

What is the effective power used?

- A. I find by comparison on trials of machinery of the same character at other places, the machinery of that mill would call for about 46 horse-power.
 - Q. Now how many feet per second, whether or not about

sixty?

- A. It would call for about sixty cubic feet per second. Q. Do you know whether there are any other mills?
- A. The fall is nine feet in the winter, it is eleven feet in the summer, approximately, I should say.

Mr. Butler. You have not measured it.

The Witness. I have not measured the fall in the winter.

Mr. Butler. Please only state what you know of your own measurement.

Mr. Shattuck. Certainly, from your own measurement and investigation. You know what the flash-board is and what the fall is. Are there any other mills to your knowledge using the water over that dam?

The Witness. The Middlesex dam.

Q. Yes?

A. I understand there are.

Q. Have you any personal knowledge?

A. No personal knowledge, except inspection of the arrangements for drawing water. I don't know but other mills may be using water.

Q. Have you any knowledge as to how much?

A. No, sir; I have not.

Q. You don't know whether they are using any now?

A. No, sir.

Q. And what quantity runs over the Middlesex dam, compared with the water that is running over the Wamesit dam?

A. The water running over the Wamesit dam, when the mills are

running, is that the question?

Q. Yes, when the mills are running generally. When I say over the Wamesit dam I mean, the flow of the river.

A. It would only differ by the flow of Hale's brook. Q. What is the flow of Hale's brook in summer?

A. It fluctuates very much; the minimum is not over four cubic feet per second.

Q. What is the water-shed?

A. Of Hale's brook? It is about twenty-four square miles, as I make it out by the State map.

Q. Have you measured the water in the Concord river?

A. Yes, sir.

Q. From what time to what time?

A. I measured the water from the 24th day of August to the 25th day of September last.

Q. Will you state what the minimum supply averaged for the

twenty-four hours.

A. The minimum during the working-day, — the least flow of the river during any working-day of twenty-four hours, that is, the minimum average for the whole twenty-four hours of any working-day, was ninety-nine cubic feet per second.

Q. (By Commissioner Russell.) That is for the whole twenty-

four hours?

A. Yes, sir.

Q. (By Mr. Shattuck.) What was the least average for a working day of eleven hours and a quarter?

A. Do you mean the average of all the water that flows in the

river?

Mr. Butler. They don't work so up there.

The Witness. I know they don't work so because they run nights.

Mr. Butler. They cannot run but $11\frac{1}{4}$ hours a day under the

contract.

Q. Well, you may state (of course that fact comes in for what it is worth), during the working hours, what is the average.

Mr. Butler. I don't get that question exactly, Mr. Shattuck.

Q. How often did you measure the water?

A. About once in forty minutes.

Q. Now, I want to know the least average per working-day

when the mills were running as much as they were running.

A. The smallest quantity of water flowing while the mills were running, that is, the average for a day,—the average from the time when the mills start in the morning until they stop at night, was 139\frac{3}{4} cubic feet per second.

Q. (By Commissioner Russell.) That is the minimum?

A. Yes, sir; that is the minimum during that period. I beg pardon; there was one smaller than that, $135\frac{8}{10}$.

Q. (By Mr. Butler.) What day was that, sir?

A. Saturday, the 16th day of September.

Q. Give the smallest quantity that you measured at any one time during the working hours.

A. It would take a good while to be sure that it was the smallest

quantity.

Q. Well, give about the smallest quantity; take the smallest

one that day.

A. I had it as low as 105 cubic feet per second that day, Saturday, the 16th day of September.

AFTERNOON SESSION.

Direct examination of J. P. Frizell. — Continued.

Q. (By Mr. Shattuck.) You have given the minimum flow during the working hours of a day as 105 cubic feet per second. Was there any lower than that?

A. I have one on that same day lower than that, at seven o'clock in the morning; but I think that is about as low as we should find after the mills had got fairly running.

Q. I suppose there are times when there is nothing running?

A. There is no time when there is not something running.

Q. What is the lowest?

A. I found it as low as twenty-five cubic feet per second. That was the average for the whole day, — Sunday, — the twenty-four hours.

Q. What was the average flow during the month, during the working day, and during the twenty-four hours, from the 24th of

August to the 25th of September?

A. Counting the entire thirty-one days during which the measurements were made, the average, including Sundays, was 128.3 cubic feet per second.

Q. That was for the whole twenty-four hours?

A. Yes, sir.

Q. Now, what was the average during the working hours for that period?

A. The average was 210.7 cubic feet per second.

Q. What was the rainfall during that period, and just before it, as far as you can tell?

A. There had been no heavy rain since the 31st day of July.

Q. Was the effect of that perceptible when you began to measure?

A. By the gauge at Lowell, there had been no heavy rainfall since the 30th day of July. On the 31st the rain occurred at Lowell.

Q. How much was the rain-fall then?

- A. The rain-fall recorded at Lowell on the 31st of July was 3.62 inches.
- Q. How had the latter part of July been, very wet or otherwise?
- A. On the 23d of July there was a rain-fall of 1.28 inches. There was a large quantity of rain-fall in July.

Q. How much?

A. About seven inches, by the Lowell guage. The gauge at Lake Cochituate showed a fall of 4.38 inches on the 31st day of July.

 \check{Q} . How much fell during the month of July at Lake Cochituate?

A. It is not carried out here. I can tell you approximately. By the gauge at Lake Cochituate, there was something over nine inches during the month of July. There was a rain-fall recorded at Lake Cochituate of 1.52 inches on the 18th of August. That is the only heavy rain. There was only one other rain recorded in August at Lake Cochituate. That was on the 8th, which was three-tenths of an inch. There was also a rain-fall recorded at South Framingham of 1.23 inches on the 17th of August. The month of August, by all the records, was a month of exceptionally low rain-fall.

Q. How does the month of July compare with the average?
A. The month of July was a good deal above the average.

Q. Now, you may give the rain-falls during the time you were measuring the water.

A. The principal rain-fall that occurred while we were measur-

ing was about the 18th of September.

Q. How much was that at Lowell, and how much at Lake Cochituate?

- A. That is recorded as 2.72 inches at Lowell, the 19th; 2.4, the 18th, at Lake Cochituate.
 - Q. What effect did that have on the water?
 - A. The flow of the river increased directly after this rain-fall.
- Q. Will you state the average during the working-days for suc-
- cessive days after the rain?
- A. The average flow on the 18th day of September was 158.9 cubic feet per second,—the average flow for the whole twenty-four hours. That was the day the rain occurred in the district that would affect the flow of the river.
 - Q. How much was it the day before?
 - A. The preceeding day was Sunday, when we had only 25.7.
 - Q. The preceding Saturday, how much?
- A. The preceding Saturday we had ninety-nine cubic feet and a fraction, on the average.
- Q. There is always a larger flow on Monday, whether you have rain or not, is there not? You have found it so, haven't you?
- A. Yes, sir,—that increase on Monday might have been due to causes independent of the rain-fall, in a considerable measure. On Tuesday there was 201 cubic feet per second. On Wednesday there was 205.9. On Thursday, 194.4. On Friday, 202. On Saturday, 174.5. On the next Monday there was 205.4. That was the last day of the measurements. The measurement on that day did not include the entire day.
- Q. Now, let me ask you if you ever measured the water when the flow was maintained steadily above the stone dam, but below the top of the flash-boards,—maintained steadily, with a slight reduction?
- A. On the 19th of September, between ten o'clock in the fore-noon and four in the afternoon, it was in that condition.
 - Q. State what condition it was in.
- A. The water was about one inch below the top of the flash-boards, whatever they are.
 - Q. In drawing, state whether they diminish the height or not.
- A. The water fell twenty-one one-hundredths of a foot, according to the observations, from ten o'clock until five.
 - Q. How much were they drawing at that time?
- A. September 19th, at ten o'clock, there was 297 cubic feet per second running.
 - Q. Give it from hour to hour.
- A. At 10.40 o'clock it was 289 cubic feet per second. I omit the fractions. At 11.20 there was 277 cubic feet; and at 12 there was 292. From 12 to 2 the quantity will be affected by the stopping of the mills. At 2 o'clock there was 286 cubic feet of water per second passing the Wamesit dam. At 2.40 there was 292. At 3.20, 302. At 4 o'clock, 295.
- Q. And it had gone down in the meantime three one-hundredths of a foot, as I understand it?
- A. Yes, sir. The water fell three one-hundredths of a foot, from 3.45 to 4.45.
- Q. Have you ever observed the amount flowing in the canal when it was the exact height of the main stone dam, without the flash-boards?

A. I believe this dam has a wooden cap. The cap of the dam, I take it, is what is meant.

Q. If you have or have not, will you state?

A. Not when it was exactly at that point, I think.

Q. Are you able to form any judgment as to about how much would flow when the water is on a level with the cap of the dam,

and is drawing so as to take the full amount supposed?

A. I don't think I could tell just how much the canal is capable of carrying. The record shows, I think, that it is capable of carrying nearly 300 cubic feet per second, without an unreasonable loss of head.

Q. What was the loss of head at the time you took these measurements that you have last given? I mean, what was the difference in the height of water between the place where it goes

into the canal and the race-way the other way?

- A. On that day, September 19th, at twenty minutes past ten, the water at the Wamesit dam stood at the height of 43.66 by the locks and canals scale, and at 10.38 the water opposite Mr. Wood's mill stood at the height of 42.98. There was a fall of $\frac{68}{100}$ of a foot in that distance.
- Q. Is there any other observation made by you that bears on the question of the water flowing in the river, except what you have stated?

A. I presume there are a good many.

- Q. I mean, any other observation of yours that you have here?
- A. I suppose the lawyers know better than I do what bears upon the case.
- Q. I will ask you the question in another form. From your observation and knowledge of the flow of Concord river, at the Wamesit dam, what in your judgment, was the available flow, before the taking for mill purposes, such as a prudent mill-owner would have provided machinery for.

A. That depends upon whether he proposes to run his machinery

during the day, or both day and night.

Q. To run by day, as the water was used. That is what I mean.

A. You couldn't depend upon drawing, during the daytime, more than 220 cubic feet per second, during the working hours of the day, in the present condition of things.

Q. I mean, before Sudbury river was taken?

A. I mean, before Sudbury river was taken; but assuming that people draw water at night, as they do now.

Q. (By Mr. Storey.) That is, during the whole year, you

mean?

A. That is about what you could rely upon.

Q. (By Mr. Shattuck.) For what time should you say you could rely upon it?

A. Well, there might be perhaps three times in a year that you

would be scant of water for several days at a time.

Q. You consider that the power that could be counted on with reasonable expectation?

A. Yes, I think a man might make calculations upon that.

Q. Will you give your reasons, if you have any, for that judgment? State whatever influences your mind.

A. Well, by comparing the rain-fall during the period of our measurements with the records of rain-falls in past years.

Q. Any other?

A. That is the chief consideration that I proceed upon.

Q. What is your opinion as to the amount of flow in the canal when the flash-boards are off, without drawing down the head more than six or eight inches, as you did on that occasion?

A. The amount of water that the canal will carry.

Q. You have stated that on one day, when it was within about an inch of the top of the flash-boards, there was a certain amount of water running for several hours, and it drew it down on the flash-boards a certain part of a foot—three one-hundredths of a foot, I believe—and that at the time you observed there was a loss of head of sixty-eight one-hundredths between Wamesit dam and Wood's mill. Now, I want to know how much, in your judgment, the canal would carry with that loss of head, if it was full to the top of the flash-boards?

A. It was very near the top of the flash-boards then.

- Q. If that was substantially the amount, say so.
 A. That was exactly the amount that the canal could carry with that loss of head.
- Q. Whether bringing it up that additional inch would have made any substantial difference, in your judgment? If it had been, I mean, to the top of the flash-boards.

A. I think it was above the top of the flash-boards at that

time.

- Q. Did it during that day, at any time, go above the top of the flash-boards?
- A. The time that I referred to as establishing a loss of head, at that time the water was above the top of the flash-boards. I think I have stated the time wrong when I said the water fell three one-hundredths of a foot. It varied that day eleven one-hundredths of a foot between 10.20 and 4.45. (Correctly twenty-one one-hundredths.)
- Q. During that period, was it at any time running over the flash-boards?

A. It was running over the flash-boards at 10.20.

Q. Now, what was the quantity of water running at that time,

when it was running over the flash-boards?

- A. The quantity at ten o'clock in the forenoon, September 19, was 297 cubic feet per second. That includes what was running over the flash-boards.
 - Q. (By Commissioner Stevens.) And Hale's brook, too?

A. No, sir. That does not include Hale's brook.

- Q. (By Commissioner Russell.) Where did you measure?
- A. I measured the water at Massic dam, and I deducted the flow of Hale's brook.
- Q. (By Mr. Richardson.) Why do you say that there would be 220 cubic feet during the day, when your observations on the 19th show more than that?

A. On the 19th, the river was swollen by the rain of the 18th, it

was above what could be expected on an average.

Q. (By Mr. Shattuck.) And some part of the time it went below what you would expect might be depended upon?

A. Yes, sir.

Q. Have you examined the machinery of the Sterling mill?

A. Yes, sir; I have inspected it.

Q. Have you also measured the fall of the water?

A. It varies considerable, according to the condition of the river.

The average would probably be something like 231 feet.

Q. Taking thirty-six feet per second of water, what amount of effective power would that give, such as would act upon the machinery, taking the wheel as it is there?

A. It ought to give 72 horse-power, with an ordinary good wheel; and I presume it would give that with the wheel they have

there.

- Q. Take the Belvidere mill, sometimes called "Belvidere No. 2," above there on the Wamesit dam. Have you measured the fall there?
- A. Not exactly at that place; but I have at another place that will apply to that very well. I cannot give the average fall very accurately; it would be between twenty-three and twenty-four feet.
- Q. With twenty-seven feet of water per second, how much effective mill-power would you have there, with a wheel of ordinary good construction?

A. I don't know what power the wheel they have there would devolop; but you ought to have about two horse-power for every

cubic foot of water.

Q. That would be about fifty-four horse-power?

A. Yes, sir.

Q. Have you examined the machinery in the Belvidere mill No. 2?

A. Yes, sir.

Q. How many horse-power does that call for?

A. That would call for about $53\frac{1}{2}$ horse-power to drive the mill.

Q. How many sets of machinery are there?

A. There are eight sets of cards.

Q. Did you examine the machinery in the Sterling mill?

A. Yes, sir.

Q. How many sets are there there?

A. Seven sets of cards there.

Q. How much power?

A. I make the power there fifty-three horse-power.

Q. Why do you make more per set there?

- A. They have about the same machinery that consumes power; the swift-running machinery that consumes the principal part of the power; the fans and centrifugal dryers. There is one set less cards; but cards do not consume much power as compared with other machinery.
- Q. Now, I should like to ask you, assuming that mill-power to be reduced from one-fifth to one-fourth, what it would cost to make that by steam? I mean, how much per horse-power?

A. I think you ought to allow, for so small an amount of steampower as would be required there, as much as \$150 a horsepower.

Q. How do you fix it? What are your reasons for fixing it at

\$150 per horse-power?

A. Well, the prices that are paid for steam-power in small quantities.

Q. What are they?

A. \$175 and \$200 are the common prices in Boston.

Q. For how much?

A. The Sears' estate, I understand, lets steam-power. Their terms are \$175 per annum for quantities exceeding five horse-power, and \$200 per annum for quantities less than five horse-power.

Q. Suppose you increase the deficiency to be made good up to thirty and forty horse-power, how much should you allow them? Assuming a deficiency of thirty or forty horse-power, would that

be worth less than \$150, or more?

A. Assuming that it would be required all the year, or only part of the year.

Q. Say nine months in the year?

A. Assuming a quantity as large as thirty horse-power, required during the whole year, to be paid for *pro rata*, I should say that \$125 per horse-power would be a fair price.

Q. And if you went up to one hundred horse-power, what would

it be worth?

- A. I should not put it higher than \$100 a horse-power in that case.
- Q. If there is a loss in those mills, do you know of any other way of supplying it except by steam-power? Wouldn't that be a judicious and proper way?

A. It would be the ordinary way adopted in this country. There are other ways in which it might be done, by constructing

reservoirs on the stream.

Q. (By Mr. Storey.) What is the fall of the Chase mill?

A. It is not much different from the falls I have given — a little greater. I have found it as low $22\frac{1}{2}$ feet and as high as $24\frac{3}{4}$ feet.

Q. Were both measurements made when the mills were running?

A. I can't say that this particular mill was running at the time. It was during the time that the mills would ordinarily be running.

Q. Take the ordinary condition during the larger part of the year. What should you say the average fall at the Chase mill would be?

Mr. Butler. I do not understand that there is any average fall, except from back water. There may be an average when the head is drawn down; but if there is a drawing down of the canal, it does not affect the Chase mill as much as it does some others. I understand that it may differ from drawing down; but I supposed, up to now, that when there was enough to fill the canal completely, it would be the same height.

A. Suppose the canal to be full up to the top of the flash-boards, it would have a fall of twenty-five feet and about four inches.

Q. Then, of course, if it only came to the top of the dam, it would be eight inches less if the flash-boards are eight inches in height?

A. Yes, sir; that is, assuming the water at Chase's mill to be

at the height of the flash-boards.

Q. When you found it as low as $22\frac{1}{2}$ feet, that was when there was an extremely small quantity of water there? That was the lowest point you found?

A. It was.

Correction. — The fall at Chase's mill was found as low as 21.89 and as high as 24.97.

Q. (By Mr. Richardson.) Will you give the fall at Faulkner's,

Wood's, and the Bleachery?

A. Mr. Faulkner's don't differ essentially from the fall at Chase's mill.

Q. What do you put the Faulkuer fall at?

A. You might put it the same as at Chase's mill, from $22\frac{1}{2}$ to $24\frac{3}{4}$.

Q. How at Wood's?

- \tilde{A} . He has from $21\frac{1}{2}$ to 24. Q. How at the Bleachery?
- A. That would apply to the Bleachery, as I understand it. I won't say that positively, because I believe the Bleachery does not run a wheel.

Q. Did you see the wheel?

A. No, sir; I did not see the wheel.

Q. What would be the effective horse-power at Faulkner's with that fall?

A. I don't know how much he has.Q. Taking it at twenty-five cubic feet.

- A. The power would not be far from fifty horse-power, with twenty-five cubic feet.
- Q. Taking it at thirty-six feet at the Bleachery, and twenty-five feet at Faulkner's, and twelve at Wood's?
 - A. Twelve cubic feet at Wood's would be about the same ratio.
 - Q. Woods' has a little less fall than Faulkner's, has it not?A. I have taken the fall at Wood's mill. That will, I presume,

apply very nearly to the Bleachery.

Q. You have examined the Wamesit canal, have you not, all

the way through down to the Bleachery?

A. I have been over the ground. I haven't sounded the canal,

or made any exact measurement of it.

Q. In your judgment, would it have the capacity to carry to the Bleachery thirty-six cubic feet, and to Wood's twelve cubic feet, as it is now, if the water was there to go through?

A. It would if other people didn't take if out before it got there.

Q. Have you any doubt as to that fact?

- A. I have no doubt of this fact: that if no man drew more than his share, no other man would be obliged to take less than his share.
- Q. And it could be so arranged that each man could get his share?

A. I think it could be so arranged.

- Q. I want your judgment as to whether if Mr. Wood and the Bleachery had so much water of the river that they were entitled to go to their places respectively, and the water was there, the capacity of the canal would enable them to get it there from where the Wamesit fall comes in between Wood's and the Bleachery?
 - A. It would depend upon what other concerns were drawing.

Q. I say, assuming that others do not touch it, that they have it and own it, with others, is the capacity of the canal enough to carry it to their works?

A. I can only answer the question upon certain assumptions. If other parties drew all that they could, Mr. Woods and the

Bleachery would not be able to get that amount.

Q. If it was not taken before it got there to use at the dam, would the canal, after it got there, have the capacity to deliver it to the Bleachery and to Wood's?

A. I think it would.

Mr. Butler. I agree, that if there was nobody drawing but Wood, the canal is big enough to carry it.

Mr. Richardson. That is, there is not physical difficulty in its

being carried, if it is there.

Mr. Butler. If it is there at a sufficient height. The difficulty about your canal, brother Richardson, I guess is, that you want to cut it down a little, because the water has to run up hill after it gets down a certain distance.

Mr. Richardson. The difficulty may be that the Wamesit canal,

taking it out of the main canal, is a foot lower.

Mr. Butler. I don't care whether the Wamesit canal is a foot

lower, or yours is a foot higher.

Mr. Richardson. If, where the Wamesit canal takes it out of the main canal, it was on the same level with the main canal, there would be no difficulty; but if, after getting to the Wamesit canal, the water has to go a foot higher, it is a little difficult for it to get up there.

Mr. Butler. That is the exact ground of defence that the Wamesit people take, it seems to me. I should have advised that, if

they had asked me.

WITNESS. I wish to amend one answer. When I gave the amount of water called for by the machinery of the Stott mill, it was upon the assumption of a fall of nine feet.

Q. What is the fall in summer?

 \mathring{A} . The fall during those measurements was something over eleven feet.

Q. How much difference would it make?

A. As eleven to nine. The quantity of water would be diminished in the proportion of eleven to nine.

Cross-Examination.

Q. (By Mr. Butler.) Mr. Frizell, you say that the evaporation area is 4,685 acres of the marsh. That covers all there is of marsh,

partially flowed and open water between the Talbot dam and the Saxonville dam?

A. Yes, sir.

Q. And which you assume to be an evaporating area of equal power?

A. I assume that there would be as much evaporation from the

marsh as there is from the water surface.

Q. That is, you assume that area to be an evaporating area of equal power?

A. Yes, sir.
Q. Then, did you ascertain the evaporating area between Talbot and Wamesit?

A. No, sir. Q. Why, not?

- A. I had no means of getting at the area of the meadows, without making a survey of them. I was able to get the area of the meadows between Talbot and Saxonville, from the report made by the commissioners.
- Q. That is, you did not do it, because you did not have a survey of the area?

A. Yes, sir.

Q. Do you know whether that report of the commissioners is a surveyed area or not?

A. It is given as being accurately determined.

- Q. Yes, but is it given as a surveyed area, or an estimated area, — which?
- A. I can't say whether it is given as a result of a survey or not.
 - Q. Is there any survey in that report, or any plan showing it?

A. There is a plan of the river.

Q. I know, but does the plan show the area at all?

A. I think it does.

Q, Then please answer the question,—is there any measurement or map showing the area in that report?

A. There is a map, I think, and I think the area of the meadow

is marked on the map.

Q. Won't you, betwixt now and to-morrow morning, make yourself sure about that?

A. Yes, sir.

Q. Now, I suppose there would be greater evaporation and soakage, and therefore waste of water, where a river was being drawn down and filled from time to time, would'nt there? meadows were sometimes left bare, and then filled up again?

A. I think, as long as the ground is saturated with water, it

would make but very little difference.

Q. Then, it would make no difference to flow the marshes, and then draw the water down, and keep on flowing and drawing down alternately, week by week, in the evaporation or the soakage, in your judgment?

A. Unless drawing down the water dried the surface. Q. And would'nt it dry the surface more or less?

A. I should hardly think so. The backing up of the water does

not extend very far up the river. The variations of the water at

Talbot's dam do not extend very far up the river.

Q. I am not dealing now with Talbot's dam at all; I am only asking you a general question; therefore, you need not go into any course of reasoning about that; I only want to get your general belief, and put the general question to you, whether the evaporating capacity of the marsh and pond would not be very considerably enhanced where you draw it down and filled it up often?

A. If you draw it down and filled it up often, I think it would

make very little difference; that is, once a day.

Q. If you kept on drawing down sometime, and then filled it up,

would it not take up a very considerable amount of water?

- A. The water contained in the ground would run off when you draw the water down, and the ground would fill up when you raised the water.
- Q. Would you not find this condition of things, that where the water had been drawn down a considerable time, and rain came, you would hardly perceive it, whereas, if it was full, you would feel it at once?

A. I don't quite understand your question.

Q. Is not this the fact, that where a pond has been drawn down for a considerable time, and then there comes a rainfall on that drainage area, that rainfall is taken up, so that you do not perceive it in the flow at the place where the water is drawn?

A. I presume that may be the case.

Q. I "presume" that it may be, but is nt it so? That is the

question?

A. You mean, the ground from which the water is drawn? When you draw down a pond which required some considerable time to fill up again from rain, you would not perceive the effect of it so quick, as if the pond was full, perhaps.

Q. "Perhaps" is a qualification. Don't it make a great deal of

difference?

- A. It makes a great deal of difference whether the ground is saturated with water or not.
- Q. For instance, suppose the pond were drawn down between the Saxonville and Talbot's dam a foot and a half (I won't say whether it could or could not be now), and it remains drawn down some three or four weeks, in a dry time, and then there should fall on the upper half of that pond an inch of rain, would you feel it at all at Talbot's?
 - . A. I think you would feel it; not so much, perhaps.

Q. Would you feel it perceptibly?

A. I think that an inch of rain-fall would be felt at Talbot's

dam almost any time.

Q. The Wainesit dam is drawn down frequently, and is kept drawn down for some time, depending upon the coming rainfall to fill it up, isn't it? Drawn down some inches, a foot or a foot and a half, during the summer? Is not that so?

A. We have not found it more than a foot below the cap of the

dam.

Q. Haven't there been permanent flash-boards on all the time, so that those were practically the top of the dam?

A. Yes, sir.

Q. Wasn't it drawn down a foot and over during the summer below the top of those flash-boards?

A. Yes, sir.

Q. Why couldn't you have told me so before?

A. I wanted to speak accurately.

Q. Have you any other means of forming your opinion of your own knowledge, as to the amount of water running in the river which may be depended upon, than is derived from the measurements which you have put in?

A. From the measurements and rain gauge records?

Q. Have you any other?

A. No other.

- Q. For how many years have you calculated the rain-gauge record and the effect of it?
- A. I have not made any exact calculations; that is not a matter that can be made a subject of exact calculations.
- Q. I did not ask you whether you had made exact calculations, I asked you how many years you had made any calculations upon which you based your opinion?

A. Well, I run over two or three years.

Q. Which two or three years?A. The last two or three years.

Q. Did you take into calculation whether the city of Boston was taking the water at this time or not?

A. I assumed that the water was being taken during our mea-

surements.

Q. I am talking about your calculations now, sir?

- A. I give my result upon the assumption that the water was not diverted?
 - Q. Was not diverted?

A. Yes, sir.

Q. In neither of the years?A. Not in either of the years.

Q. Did you take out any amount for its diversion in either of the years in your calculation?

A. I made the statement on the assumption that the ——

- Q. I don't ask you what your statement was; I ask you for your calculation by which you arrived at that statement?
 - A. No, I made no allowance for the water being diverted.
 Q. What rain gauge did you take to get at that calculation?

A. That cannot be called a "calculation."

Q. Well, that which you have given your sworn judgment upon? I don't care whether you call it a calculation or a guess?

A. I took the rain-gauge for Lowell, for Framingham and for Lake Cochituate.

Q. Does the rain-gauge at Lake Cochituate show an average higher or lower than the Lowell rain-gauge?

A. I can't say; I think the rain-gauge at Lake Cochituate shows a higher average generally than the gauge at Lowell.

Q. Did it the last two or three years?

A. I can't say.

Q. Did you examine the water-shed of River Meadow brook?

A. No, sir.

Q. Do you know whether it is as good, or better, or worse than the average water-shed of Concord river or Sudbury river?

A. I know that it is not so valuable.

Q. How do you know that, if you did not examine it?

A. I know from the flow of the brook, that is all.

Q. Have you any knowledge of the flow of the brook, except for a month?

A. No.

Q. Then you know that it is not so valuable, because you know the flow of the brook, in the driest time, for one month. How many measurements did you make of the flow of that brook?

A. I ascertained the flow of the brook about twice every three

hours.

Q. How?

A. By means of a weir.

Q. Where did you put the weir?

A. In the dam belonging to the Bleachery.

Q. At the Bleachery dam?

A. Yes, sir.

Q. Were they using their draft below their mill-race or above?

A. What do you mean by "their mill-race?"

Q. Well, I mean pretty much what I say. There is a dam and generally there is a mill-race where they use the water?

A. The bleachery has two yards; this dam is in the upper yard

of the bleachery.

Q. Did you put it above where the bleachery takes out any water, or below?

A. There was a little water taken out above, I think, and discharged immediately below.

Q. How did you get at that?

A. I made a little flume below the dam, and took the leakage of the dam and what is discharged from the building in the bleachery yard.

Q. Where did you put the weir?

A. The weir was on the dam.

Q. Was there any water running over the dam?

A. The water was running over the dam during our measurements. The water ran over our weir always — over the weir and over a part of the dam.

Q. Which did it run most over, your weir, or through the

flume?

- A. There was a very small quantity running through the flume.
- Q. Now, having ascertained your mode of measurement, let me go a little more carefully into what you did measure; how often did you measure?

A. I noted the height of the water every forty minutes.

Q. For how long?

A. For thirty-one days.

Q. Give me the flow for thirty-one days on the River Meadow brook?

A. I have not computed the average flow for any day.

Q. I have not asked for the average. Give me any measurements you made of the brook? In the first place, you gave us the minimum as four feet.

A. I don't remember that I gave the minimum.

Q. Yes, sir, you gave the minimum at four feet per second, as I remember it, because I made a little calculation based upon that.

A. I guess Mr. Shattuck stated that.

[By reference to the minutes of the commissioners, it appeared that the witness so stated.]

Q. Then you assumed that it was very variable, and I want to

see how it varied.

A. On the 13th of September, the flow did not reach four cubic feet per second but twice during the time.

Q. Now, won't you begin on the 24th day of August, and go

on; that will be the better way.

- A. On the 24th of August, Thursday, the measurements were commenced about 10.45 in the afternoon. The quantity passing Hale's brook was extremely small. It did not amount to a cubic foot per second until half past one. At 1.40 it was 2.10 cubic feet; at 1.45, 4.21; at 1.50, 6.16; at 1.55, 7.76; at 2 o'clock, 9.02 cubic feet; at 3 o'clock it was 11 cubic feet; at 3.30, 10.35; at 4, 9.91; at 4.30, 9.70; at 5 it was 9.61; at 5.30, 9.36; at 6, 8.9; at 6.30, 8.4; at 7, 8 cubic feet; at 7.30, 7.80; at 8, 7.76; at 8.30, 7.60; at 9 o'clock, 7.41; at 9.30, 7.41; at 10, 7.21; at 10.30, 7.02; at 11, 6.98; at 11.30, 6.83; at 12 o'clock, Friday morning, it was 6.64.
- Q. About one hundred rods above there, there is a small dam, isn't there?

A. There is a dam a short distance above.

Q. And if those mills happen to be running, there will be some water in the brook; and if they do not happen to be running, there isn't any?

A. That is the fact.

Q. Now, let us take from 12 o'clock to 12 the next day. Give me what it was from 12 o'clock at noon Friday to 12 at night.

A. At 12 in the morning it was 6.64; at noon it was exactly the same, 6.64.

Q. How was it at 12 at night, Friday?

A. 6.68.

Q. How was it at 12 at noon, Saturday?

A. It was 7.02.

Q. How was it at 12 at night, Saturday?

A. That was 5.91.

Q. How was it at 12 at noon, Sunday?

A. It was 6.31.

Q. How was it at 12 at night, Sunday?

A. It was 5.8.

Q. How was it at 12 at noon, Monday? ·

A. It was 5.27.

Q. How was it at 12 at night, Monday?

A. 5.17.

- Q. How was it at 11 at noon, Tuesday?
- A. It was 5.27.
- Q. How was it at 12 at night, Tuesday?
- A. It was 5.62.
- Q. How was it at 12 at noon, Wednesday?
- A. 6.76.
- Q. How was it at 12 at night, Wednesday?
- A. 5.24.
- Q. 12 at noon, Thursday?
- A. 5.55.
- Q. 12 at night, Thursday?
- A. 5.55.
- Q. 12 at noon, Friday?
- A. 5.21.
- Q. 12 at night, Friday?
- A. 5.24.
- Q. 12 at noon, Saturday?
- A. 5.14.
- Q. 12 at night, Saturday?
- A. 5.55.
- Q. Now, Sunday noon?
- A. 5.21.
- Q. 12, Sunday night?
- A. 4.97.
- Q. Monday noon?
- A. 4.70.
- Q. 12, Monday night?
- Ä. 4.22.
- Q. Tuesday noon?
- A. 3.91.
- Q. 12, Tuesday night? A. 3.6.
- Q. Wednesday noon?
- A. 3.08.
- Q. Wednesday night?
- A. 3.28.
- Q. Thursday noon?
- A. 3.34.
- Q. Now, we have got round fifteen days. It is a pretty constant stream, isn't it, upon the whole? It did not vary much those fifteen days, did it?
 - A. Not much that fifteen days.
- Q. Which fifteen days did it vary, so that you swore it was variable?
- A. If you will go on, we will come to the variations. There was nothing to make it vary until there came a rain.
- Q. When you got over to about the 19th of September, I guess it varied considerably, didn't it?
- A. At noon, on the 18th of September, it was 24 cubic feet per second.
 - Q. What was it at midnight on the 18th?
 - A. At midnight on the 18th there was 27.01.

Q. Now, take it the next day at noon?

A. At noon, on the 19th, there was 32.26. At midnight, that is, the commencement of September 20, there was 25.7.

Q. How much rainfall was there?

A. The day before it began to rise, by the Lowell guage, the rain did not come at Lowell until the 19th. It commenced to rise on the 18th. The rain at Lake Cochituate occurred on the 18th; 2.4 inches.

Commissioner Francis. The rain at Lowell, as I happen to know, is put down when it is ascertained. It frequently falls the day before. The day does not end until 12 at night, and the man does not get at it until the next day; and it frequently appears the day following the rain.

Q. How far is the head water of River Meadow brook from

Lowell?

A. I can't say.
Q. About how far?

A. I don't know that I have the remotest idea of it.

Q. Is it five miles off?

A. I should think it would be rather more than that; but I can't say positively about that.

[Adjourned to Wednesday morning, at 9.30 o'clock.]

Boston, Wednesday, Oct. 11, 1876.

The commissioners met at 9.30 A. M.

JOSEPH P. FRIZELL, continued.

I wish to explain or correct my testimony as to the WITNESS. height of the water in the canal on the 19th of September, at the Wamesit dam. At 10.20 it was 43.66.

Q. (By Commissioner Francis.) That is on locks and canals

scale, as you call it?

- A. Yes, sir; I can give you an intermediate time. At 3.45 it was 43.48; at 4.45 it was 43.45.
 - Q. That gives a fall of $\frac{21}{100}$ then in the canal at the same time?

A. There are various heights in the canal.

- Q. Well, at nearly the same times. Give us at the same time as near as you can at Wood's?
- A. At Wood's at 10.38 to 10.40 it was 42.98; at 4 o'clock it

was 42.56.

Q. (By Mr. Shattuck.) Now the quantities running at those times?

A. At 5 o'clock it was 42.50.

Cross-examination.

Q. (By Mr. BUTLER.) It would seem from the measurements you gave us last night, that River-meadow brook answers very quickly and efficiently to any rainfall, in delivering its water?

A. Yes, sir; that is correct.

Q. That it remains very stable, apparently, in dry times for a series of days, and quite stable in a wet time for a series of days?

- A. I don't understand it to remain stable in a wet time for any great length of time; that is, no longer than the wet weather continues.
- Q. If you answer in that way I took three days following the 19th of September — I shall have to ask you to go on.

A. Go on from the 20th?
Q. You gave us three days, the 18th, 19th and 20th.

A. Now I will give you the 21st.

Q. Now give me the 21st at, noon and night; and I will also take the noon and night on the 18th, 19th and 20th?

A. On Thursday, Sept. 21st at no o'clock, that is at midnight, the quantity passing Hale's brook was 7.6 cubic feet per second.

Q. At noon now?

A. 19 cubic feet per second.

Q. At midnight, then, it is only 7, and in the day it was 19. Give us the next midnight, the 22d?

A. 15.48.

Q. The next at noon?

A. At noon, Sept. 22d, 12.90.

Q. At midnight?

A. 12.56.

Q. At noon the next day?

A. 12.47.

Q. At night the next day?

A. 4.57. That which I am speaking of is the commencement of Sunday, Sept. 24th. At noon, Sunday the 24th, we have 5.66.

Q. At midnight, Monday?

A. At midnight, between Sunday and Monday, we have 9.91.

Q. At noon, Monday?

A. That is the extent of the measurements.

- Q. How do you account, sir, if you can account, for the fact that on the 21st, at midnight, it was only 7 cubic feet, and at noon the next day it was 19 cubic feet, if I get you right, in round numbers?
 - A. It is undoubtedly owing to the effect of the dam above.

Q. That is, the dam held back the water?

A. That is presumable.

- Q. Then an inch, and better, of rain in that vicinity, will increase the flow of Meadow-river brook more than six times?
- A. There was more than an inch of rain; two and a half perhaps.
 - Q. Whatever there was increased it? A. Yes, sir.

- Q. Now the fact that a stream answers quickly to the effects of a rain, is not such a fact indicative that it is a good drainage area?
- A. It might be good from some points of view, but not good for water-power at that point you are speaking of.

Q. How?

A. Not good with reference to water-power in the immediate vicinity.

Q. It is a good drainage area but not good for water-power?

A. It may be good for some purposes, but the value of waterpower depends upon the steadiness of the supply. If a stream is a torrent at one time and nearly dry at another, it is not good for water-power.

Q. Is it not a fact that all streams operate in that way as a rule, quickly answering to a rain, the water quickly running off, and

then becoming small in amount?

 Λ . It may be affirmed that, as a general thing, the larger the

drainage area the less the fluctuation.

Q. Then you would expect a great deal more steadiness in four times or five times a drainage area, than in one-fifth of a drainage area, would not you?

A. Yes, I should expect some more.

Q. Considerably more?

A. It would depend upon some of the other circumstances.

Q. Well, other circumstance being equal? A. Other circumstances being equal; yes, sir.

Q. Now, do you know anything of the circumstances, of your own knowledge, of the drainage area of the Sudbury river, as compared with the drainage area of the Assabet and the Lisabet?

A. The only feature that can affect the —

Q. Do you know anything, I am asking, now, of your own knowledge?

A. Yes, I know something of my own knowledge.

Q. What do you know of the Assabet; were you ever on it? A. I have never been on the Assabet that I remember of.

Q. Have you ever been on the Lisabet?

A. What river is that?

Q. Well, if you don't know, then you have never been on it, and that is sufficient for my purpose. Have you ever been down on the Sudbury?

A. Yes, sir. It is not necessary to go on to those streams to

understand that fact.

Q. To ascertain what the drainage area is, it is not of any con-

sequence to know the nature of the ground?

A. To understand whether the flow should be more uniform on the Concord river, than on the smaller streams, it would not be necessary to go up into the head-waters for that.

Q. I am not asking you that question. For an engineer, even one who has been twenty years in practice, to know the effectiveness of a drainage area, it would require that he should go on to it, wouldn't it, or see and know the condition of the country?

A. I don't know what you mean by the effectiveness of the drainage area; if you mean the aggregate quantity of water

discharged ---

Q. We have dealt with the effectiveness; that depends wholly upon whether the water runs off suddenly or don't run off suddenly, which is the effectiveness of a water-power. Now, in order to know that, is it not necessary to know by actual measurement of the stream, or by actual observation of the drainage area?

A. If you want to know the character of the Assabet where it joins the Sudbury, it might be necessary to examine the stream. If you desire to know the efficiency of the Assabet in that respect

at the point where it joins the Sudbury-

Q. What would you do?

A. Examine the stream for that purpose.

Q. What would you do to find it out?
 A. An examination of the stream would be useful.

A. An examination of the stream would be useful. Q. What other means would you have of knowing?

A. My knowledge of such matters.

Q. But the knowledge must be applied to the facts before you, must not it? Your theoretical and scientific knowledge must be applied to the facts. What other means would you have of knowing the capacity, as an effective water-shed or drainage area, of the Assabet river, for instance, without knowing the character of the ground, whether it was marshy, whether it was a flat country, or whether it was a rolling country?

A. Measure the discharge of the Assabet for a long period.

Q. If you could have the discharge of the Assabet for a long period. Have you got that?

A. I have not got it separate from other streams.

Q. Will you tell me whether this would not be the most accu-

rate mode of getting the Sudbury in a matter of comparison, the most accurate mode open to us, rather than taking the rain-gauge simply. The reports of the City Engineer, if they are correct, show the gauge of the water delivered for a series of years, say ten, from Lake Cochituate, which is the nearest rain-gauge. Now, assume that quantity to be the actual capacity of the drainage area of Lake Cochituate, then compare that drainage area with the area of the Sudbury — do you know any more accurate method of instituting a comparison than that?

A. That might be correct as to the aggregate quantity of water

that the Sudbury would discharge.

Q. Yes, that would be correct as to the aggregate quantity of water, but whether it would discharge it suddenly or slowly would be entirely another question?

A. Yes, sir.

Q. And that would depend upon your knowing the character of the water-shed, would it not?

A. Unless you have measured the discharge.

Q. Do you know any more accurate way of getting at it, in the

absence of the measure of the discharge, than that?

A. Well, the ratio of the discharge to the rainfa'l, as determined from the observations at Lake Cochituate, is a good deal lower than other observations have shown.

Q. I didn't ask your opinion upon it, sir. That, I assume, may be an element in the calculations, but I am asking you if you know of any more accurate way of getting it. Please now, don't, Mr. Frizell, fence with me and undertake to tell me something to make your case.

Mr. Shattuck. That is an uncalled-for observation.

Mr. Butler. I want an answer to my question, whether that method of measuring would or would not be more likely to be more accurate than any mere computation of drainage area?

WITNESS. We are talking about a computation of drainage

area.

Q. I am not talking about that at all, sir. I will repeat the question and see if you can understand it; this is it: the actual discharge of water from Lake Cochituate has been measured for many years; Lake Cochituate has a certain drainage area which has been computed accurately; now, then, that drainage area is the nearest to the Sudbury river. Now, taking the actual discharge of that drainage area, and computing the drainage area of Lake Cochituate, and computing the drainage area of the Sudbury river, in the absence of actual measurements of both, do you know of any more accurate way of getting the probable discharge of Sudbury river?

A. You mean to determine the ratio of rainfall to discharge

from observations at Lake Cochituate?

Q. I mean exactly what I say; do you know any more accurate way, in the absence of actual measurements, of getting the probable discharge of Sudbury river?

A. I should have some hesitation about applying the results that have been found at Lake Cochituate to a considerably larger

drainage area.

Q. Without knowing anything about the difference between the two drainage areas?

A. That is hardly a supposable case; I should expect to know

something about them.

Q. Well, do you know anything about them?

A. I know from the map.

Q. I know they look all alike on the map; don't they?
A. I am talking about the extent of the drainage area.

Q. I am not asking you about the extent of the thing; one is larger than the other. Do you know anything to show any difference between the efficient capacity, except its size, between the drainage area of Lake Cochituate and the drainage area of the Sudbury river?

A. Nothing; but I—

Q. Very well, then. If you had the exact amount of water afforded by the drainage area, for a large number of years, of the Lake Cochituate water-shed, and that being very near the Sudbury river — quite near the Sudbury river — is there any more accurate way of getting the results from the drainage area of the Sudbury river than to apply the measurement of the water discharged?

A. As I said before, I should hesitate a little to apply it.

Q. Why?

A. Because the results found at Lake Cochituate show a considerable less ratio of discharge, as compared with rainfall than observations at other points.

Q. Leave out the evaporation surface of Lake Cochituate in my

estimates of the drainage area.

A. I presume others have done so too.

Q. Now, then, your trouble would be, that the actual measurements of the drainage area of Lake Cochituate have been found to be below what the calculated results were?

A. Found to be low as compared with other observations.

Q. Other observations, where?A. At New York, for instance.

Q. Or say in the mountains of Burmah, where there falls twenty-four inches of rain in twenty-four hours. I take it, there is a great difference between the two; but I ask, has there been any observation in the neighborhood which determines anything wrong?

A. I am not aware of any observation at all in this vicinity.

Q. Then there has not been any other observations in this vicinity?

A. Not that I know of.

Q. Now, then, as an engineer, please state to these practical gentlemen, why you think it would be more satisfactory to get the amount of water that would fall on a drainage area in Massachusetts, to take observations upon drainage areas in New York or take the actual results of the drainage area in Massachusetts?

A. I should examine the circumstances that affect the question.

Q. I am giving you the exact question. Which do you think would be less likely to be accurate, the results obtained from experiments on a drainage area in New York, or the actual measurements of a drainage area within five miles of the Sudbury river?

A. Other things being equal, I should prefer the results obtained in Massachusetts.

Q. Do you know anything to show that the other things are not equal as between the drainage area of Sudbury river and the drainage area of Lake Cochituate?

A. Anything to show that other things are not equal as between

those two drainage areas?

Q. Do you know of anything to show that the other things are

not equal in those two drainage areas?

A. The records of rainfall at Lake Cochituate are somewhat in excess of those at other points; and I know that —

Q. In excess of what?

Mr. Shattuck. He was finishing.

A. I know that there are very serious differences between the amounts of rains registered at points not far from one another.

Q. (By Mr. Butler.) From where?

A. Not far apart, and the presumption is very strong that the rain-gauge records at Lake Cochituate exhibit an exceptional rainfall; there is no doubt that they are correctly kept.

Q. And the exceptional matter at Lake Cochituate is in excess,

is it not?

A. The rainfall is in excess, and would show a —

Q. That would be corrected, would it not, by the fact that if the measurements are right that you would get the exact amount of water which does come from that area?

A. You would not get the amount of water correctly; you would get an exceptionally low ratio of discharge. The ratio of the discharge of the rainfall would be low, and apply that to another district, you might make an error.

Q. But, pardon me, you are not applying that to another district; you are applying it to the same district in the same vicinity

within five miles.

A. You can see by my measurements at Lowell what great

differences there are between contiguous districts.

Q. It has been suggested to me that you may have misunderstood me all this time. I am not asking you to apply the percentage of rainfall at Lake Cochituate as the test, but the actual water produced and measured through the gateway of the city on that area. Did you understand me to talk about that?

A. I understood you to compute the quantity of water discharged by the Sudbury, from results obtained on the Cochituate

drainage ground.

Q. Well, what results?A. The only way that could be done —

Q. What results did you understand me to ask you about?

A. The amount of water discharged as compared with the

amount of rain falling.

Q. No, sir. I am taking the amount of water discharged to be what the rainfall produces in practice. Now, then, I find that the actual amount of water discharged on the Lake Cochituate drainage area is so much; now I find that the drainage area of the Sudbury is double or treble that; should I expect to find the

Sudbury to be more than double and treble that actual measured discharge?

A. I think the chances are that you would.

Q. Why?

A. From the fact that the discharge of the Cochituate district,

as compared with the rainfall, is exceptionally low.

- Q. Why, then, should you expect that the rainfall would not be the same in a nearly contiguous district might or might not be?
- A. The rainfall often shows remarkable variations in contiguous districts.
- Q. And you don't know any reason why there is any variation up there?

A. I don't know any reason; no, sir.

Q. Which would you rather do for accuracy, have the actual results of the water-shed, or drainage area of the Cochituate, as a standard of comparison, or take simply a supposed percentage of the rainfall on the several drainage areas, to get at the amount at Sudbury?

A. If I had examined all the processes by which the results on the Cochituate were obtained,—and I had no reason to question their accuracy,—I should probably not hesitate to apply them.

Q. Then, if you believed that the city has honestly measured

its water for itself, that would be the best test?

A. I don't raise any question as to anybody's honesty.

Q. Well, if the city has accurately measured the quantity of its water, that would be the best test?

A. I don't know any reason why it would not be, sir.

Q. Now, sir, I want you to take the quantity of water that has flowed in the months when the water flows the least at Cochituate, and assume that the rainfall of Sudbury will give an equal amount of water on the water-shed, and tell me how much water will run in the Sudbury river during the same months. I want you to verify this paper, if you will, and we have called it a paper showing approximately the flow of the Sudbury river water-shed of 75½ square miles, in cubic feet per second, for 24 hours per day, the averages being taken by months,—the results given being an average of the terms of nine and thirteen years, and that average got at by taking the actual flow from Lake Cochituate?

-Mr. Shattuck. Is this evidence?

Mr. Butler. It is going to be evidence.

Q. Now, will you see whether it is an accurate statement of it? Take a little time for it. I will call your attention to it by and by. That is got, assuming the actual outflow of Lake Cochituate, the production of that drainage area, and then see if we get the right deduction.

Mr. Shattuck. This is simply putting in city reports. Mr. Butler. I am not putting in any city reports.

Commissioner Russell. The only question put to the witness, as I understand it, is as to the correctness of certain mathematical calculations on that paper.

Mr. Butler. Yes, sir. Whether they are calculated on correct

principles; that is all.

Commissioner Russell. There is no question of principle, as I understand it. It is only in regard to the simple question of figures.

Mr. Butler. That is, assuming certain results would come. I might take time and go over each one, but that is not necessary.

Mr. Shattuck, Is 75½ square miles to be the admitted water-

shed of Sudbury river?

Mr. BUTLER. It is the admitted actual water-shed of Sudbury river, but it is not the admitted actual water-shed of Sudbury river down on a map. Keep that with you all the time, because the maps make it about three per cent. less. If you compare map with map, then you want the water-shed to be 73.351; if you compare that with actual survey, making the same allowance in the larger region that you do in the region actually surveyed, then you want to carry that up to about 73.73.

The WITNESS. You will have to give me time to examine this

one.

Q. Well, sir, if there is any other, we will give them to you. Did you look up for me, as I asked you to, the distance of the River-meadow brook from Lowell?

A. The distance to the extreme boundary of the drainage ground is about eight and three-quarters miles from Wamesit dam.

Q. And the average distance of the brook from Lowell?

A. I could not say accurately; probably four or five miles, -

something like that.

Q. Now, then, we will come, if you please, to the Wamesit dam. Is not the height of the water in the canal regulated by head-gates?

A. In the Wamesit canal?

Q. Yes, sir.

A. The height of the water at the dam?

Q. No; the height of the water in the canal?

A. I presume that it can be raised or lowered by head-gates. Q. That is, by hoisting the head-gates you can raise the water in the canal, or shutting them down lower it?

A. I am talking about the head-gates at the dam.

Q. Yes, sir; I am talking about the head-gates at the dam.

A. Yes, sir; that is correct.

Q. That is, if you should lower the gates so as to make their capacity less than the canal would discharge, after you draw the water down in the canal, then the water would be drawn down by the canal by the wheels below?

A. The lowering of the head-gates would occasion a loss of head

at that point.

Q. What?

A. The lowering of the head-gates would occasion a loss of head

at that point.

- Q. Why can't you answer my question? Can't you answer that? My question is, if the head-gates were so lowered as to diminish their capacity to let water into the canal, the inevitable effect would be that it would be drawn down?
 - A. Yes.

Q. If they were raised higher, more than the capacity of the canal, and there is water enough in the river, the head would keep up if the canal had capacity enough to carry?

A. If they were raised you raise the height of the water in the

canal.

Q. So that the height of the water in the canal depends on the manipulation of the head-gates when there is water enough in the river to fill the canal?

A. It depends in some degree, undoubtedly.

Q. Must it not wholly?

A. When there is plenty of water in the canal.

Q. When there is plenty of water in the river, must it not wholly?

A. No, sir; it won't depend wholly on that.

Q. Suppose the water was running five feet deep over the dam, and I should shut down the head-gates, would there be any water in the canal?

A. No, sir; that is, if they were tight and the water was

drawn out.

Q. And if the mills were running, that would be none. Well, then, I could open them just at the capacity to fill the canal, couldn't I, with all the mills running. There is no doubt about that, is there?

A. To fill the canal?

Q. Yes.

A. If you should open them wide enough so that the water would stand but very little lower on the downstream than on the upstream side.

Q. It would fill the canal?

A. It would raise the water to that height.

Q. With the water running five feet over the dam, I could open the head-gates, if they had capacity enough, so as to entirely over-flow the canal, couldn't I.

A. I should judge so.

Q. Then does not the height of the water in the canal, if there is water enough in the river to fill it, depend wholly on how the gates are manipulated?

A. No, sir. The height at Mr. Wood's mill depends on the quantity of water the mills are drawing, if they are drawing more

or less.

- Q. Suppose I let in enough more than they could draw. I can do that, if there is more than enough in the river?
- A. There will always be a certain loss of head in the canal, apart from that which occurs at the gates.

Q. That depends on its capacity?

A. On the amount of water being drawn from it.

Q. It depends on the capacity to furnish the amount of water being drawn.

A. Yes, sir.

Q. How much capacity, if you had water enough to fill it, has the Wamesit Canal for carrying, in your judgment?

A. I think we found something over 300 cubic feet per second

running, when the water was above the cap of the dam.

Q. How were the gates.

A. I don't know anything about the gates.

Q. Do you mean to say that you have been up there measuring a month, and never have taken into consideration how high the gates were, or whether they were clear up, or clear down?

A. I know by the loss of head that occurs.

Q. When you took the loss of head at Mr. Wood's, did you take the loss of head directly at the head-gates?

A. No nearer than Mr. Faulkner's mill.

Q. And whether that stood substantially at the height of the head-gates, or not, you don't know?

A. I did not observe it in the immediate vicinity of the gates.

Q. So that all your observations lacked, was the element of knowing how the gates were opened, what they were capable of discharging at that moment?

A. I could not tell what they discharged at that moment.

- Q. Whether they discharged enough water to fill the canal you don't know?
 - A. We know what water they discharged. Q. You know what did go through them?

A. Yes.

Q. But whether any diminution of that quantity of water came from the gates being hoisted too little, or from want of water in the river, you don't know?

A. I can tell you something about that by the height of the

water at Mr. Faulkner's.

- Q. How high would the water be at Mr. Faulkner's, supposing the other mills were drawing and my head-gates should shut down?
- A. If shut down entirely it would be all discharged from the canal.

Q. Suppose they were shut down half way?

A. I don't know anything about that.

Q. That is exactly what I want to find out: you don't know anything about the condition of the gates, and can you know anything about the amount of water which would run into the canal without knowing the condition of the gates?

A. I could tell you the loss of head occasioned by the gates

approximately.

Q. That would depend on how wide open they were, wouldn't it?

A. No matter what it depends on, I know what it is.

Q. I know what it is, I know you know what it is; that is, we know something how water stands by measurement. All of us can read a gauge that have good eyesight, but do you know what caused it, without knowing how wide the gates were opened?

A. I should not be able to separate the effect of the friction in

the canal, from the effect of the gates.

Q. You would not?

A. No, sir.

Q. Now, sir, did you think to measure another thing: did you measure the height of the bottom of Mr. Wood's canal, or level of the bottom as compared with the level of the rest of the canal, whether higher or lower?

A. No, sir; I did not measure that.

Q. Well, whether he got a good deal of water or very little there would depend on whether the bottom of his canal was higher or lower than the canal leading into or furnishing its supply, when the supply was low, would it not?

A. He could draw more water by lowering his orifice.

Q. [Illustrating by a diagram.] Suppose that that line represents the bottom of the feeding canal down to the end of the Wamesit Company's land and this line represents the bottom of Mr. Wood's canal?

Commissioner Russell. It will be difficult for the reporter to

get that, unless you describe it.

Q. Supposing a line representing the bottom of the Wamesit Company's canal runs in an inclination, toward the lower end of the canal, of two degrees while the line of Mr. Wood's canal joining on shows an elevation of three degrees?

A. Deflected five degrees from the other?

Q. Yes. Would not Mr. Wood find himself substantially without water when the others might have substantially enough?

A. Such an arrangement of the canal might deprive Mr. Wood

of water altogether.

Q. Do you know that that exact arrangement don't exist? Did you measure to find out?

A. I measured nothing but the fall of the water at the surface?

Q. As compared with the fall above? Did you take the difference between the fall at Mr. Faulkner's and the fall at Mr. \mathbf{Wood} 's?

A. I took the height at each place and got the difference.

- Q. Can you give me the difference at the time you say it was $\frac{68}{100}$ of a foot?
- A. I have given you the height at the Wamesit dam at different hours on the 19th of September.

Q. Take it the moment that it was $\frac{68}{100}$.

A. That was at 10.38 to 10.40, in the forenoon. Between 10.27 and 10.47 the height at Mr. Faulkner's was 43.10.

Mr. Shattuck. That was before any other measurements at an earlier hour.

Q. I want you to take the same hour, if you will, Mr. Frizell.
 A. That is as near —

Q. Is that the right hour?A. That is the right hour.

Q. Very well; then we will go on.

A. The height of Mr. Wood's was observed between 10.38 and 10.40; the height at Mr. Faulkner's between 10.27 and 10.47, and was 43.10.

Q. What was it at Mr. Wood's?

- A. 42.98, making a difference of twelve one-hundreths of a foot between them.
- Q. What, at that same moment, was the difference between Mr. Wood's and the dam?
 - $A._{100}^{68}$, about.

Q. Now, what was the difference between Mr. Faulkner's and the water at the dam?

A. It was $\frac{56}{100}$.

- Q. What was the difference at that time, between the water at the head-gates, the lower side head-gates, and the water at the dam?
- A. That I cannot tell; not immediately below the head-gates. Q. I know. There was nothing drawing at that time from the canal between Mr. Faulkner and the head-gates, was there?

A. I think not.

Q. Very well; and Mr. Faulkner's was far below. Now, sir, do you know whether the water stood four inches, five inches, or six inches lower at the head-gates on the lower side of the headgates than it did above?

A. No, sir.

Q. Do you know it is the policy of the Wamesit Company, when water is short — whether it was the policy of that company to keep the head-gates down, when it is about to the top of the stone dam, so as to retain the surplus water made by the flash-board?

A. I don't know anything about the policy of the company.

.Q Did you inquire?

A. No, sir.

Q. Assuming that they owned the difference in water between the top of the flash-board and the stone dam, that is, 8 inches of the whole pond, and they want to keep it for themselves, and the other company owned so much, the other part of the stone dam, the way to save it would be to put the gates so that it would only discharge the water that was running even with the stone dam?

A. They could save water that way.

Q. And whether they adopted that expedient it never occured to you to observe? If they were saving water that way, and adjusted the matter accurately, it would bring eight inches, would it not — and the water was at the top of the flash-board — it ought to bring eight inches between the height of the water in the canal and the height of the water on one side of the head-gates and the height of the water on the other side of the head-gates?

A. If they retained the water in the pond?

- Q. Yes. If they did it accurately it would make that difference, would it not?
- A. If they retained the water in the pond at the height of the flash-boards and kept it in the canal at the height of the dam, it would make that difference.

Q. And whether that was so or not you did not find out?

A. I did not ascertain that.

Mr. Storey. Do I understand you to say that the owners of the Wamesit dam were only entitled to one-quarter part?

Mr. Butler. At the dam. If you should find any other title I should be glad to see it.

Mr. Storey. I did not know what your position was.

Mr. Butler. You are to draw 288 feet, never exceeding that when the height of the water is at the permanent stone dam, and all above belongs to us. We are to keep up the flash-board,

because that tends to keep up the head. You don't own the water, and my construction is, that the Wamesit Power Company own every drop of water above 288 cubic feet, and you do not own that 288 feet except when it is running at the height of the stone dam.

Mr. Storey. That is to say the calculation is when the water is at the height of the stone dam it will deliver 288 feet?

Mr. Butler. If that is not there, then it will deliver as much as it will.

Q. Now, how did you measure the water at Massic Falls?

A. By means of the weir.

Q. Wou't you give me those measurements at the Massaic Falls? You used the weir put in by the city?

A. Yes, I used the weir that was in existence.

Q. Here (showing paper) is the profile of the height of the water. Now, will you have the kindness to see whether that profile of measurements is the height; whether, between the dates that you took, the water corresponds with your measurement?

A. It would be easier to make the comparison by means of the

table, if you have got one there.

Q. Well, sir, I would just as lief you would have one as the other. There (handing paper) are the tables, and if you will just see and report to me whether you regard that to agree. Now, Mr. Frizell, we will go to another matter; take your time about that, I want that done with accuracy. Now we will go to the Middlesex.

Commissioner Russell. The answer to that question is suspended.

Mr. Butler. Until the witness gets time.

Q. Now let us go to the Middlesex dam. How did you ascertain the quantity of water actually flowing there through those Middlesex wheels?

A. I did not ascertain that thing at that time.

Q. When did you ascertain it?

A. I did not undertake to give that quantity with any accuracy. I state they won't exceed a certain quantity.

Q. That is to say 167 or 168 cubic feet? \hat{A} . Yes, sir.

Q. How did you get at that quantity?

A. That was the result of a calculation, or a measurement and calculation which I took part in seven or eight years ago to ascertain the quantity at which -

Q. At whose request?

A. Mr. Francis' request. Q. You was requested by Mr. Francis, for what purpose?

- A. To ascertain the quantity to which the Middlesex Company were entitled under their deed.
- Q. How did the ascertainment of that amount actually running through their gates upon two breast-wheels affect the amount that they were entitled to in the deed. Was that all that they were entitled to in the deed?
- A. I understood they had deeds stipulating for such a quantity of water to be used upon such and such wheels.

Q. What were those "such and such" wheels?

A. The wheels referred to in the deed were, I supposed, to be

of the dimensions of the wheels existing at that time.

Q. So that you took the wheels on the supposition that the wheels referred to in the deed were identical with the wheels in existence seven or eight years ago?

A. That was the supposition.
Q. And upon that supposition, making your calculation seven or eight years ago, you got these 168 cubic feet? What wheels

did you take into that calculation in actual existence?

A. There were three breast-wheels, about twelve feet in diameter; the aggregate length was about forty-five feet, as I understand. And then in addition, they were entitled to sufficient water to run a fulling-mill.

Q. In 1822, at the time the deed was made?

- A. That was the problem, to find how much water could be used on three breast-wheels and a fulling-mill.
 - ·Q. How much water could be used on a fulling-mill in 1822?
- A. That is almost a matter of conjecture. It hardly admits of any estimate.

Q. That was a matter of entire conjecture?

- A. Not entirely; you could tell whether it was one cubic foot or a hundred.
 - Q. Hardly, could you?

A. Yes.

Q. Because one cubic foot would not run a fulling-mill of any sort?

A. I don't think it would.

Q. But you could tell whether thirty feet would run some sort of a fulling-mill?

A. Oh, yes.

- Q. Under the old-fashioned fulling-mill, in 1822, built perhaps fifty years before that, it might take much more than a hundred or two hundred feet?
- A. Probably not more than ten or twelve cubic feet would be used on such a machine: it might be wasted.

Q. You know what I mean when I speak of a flutter-wheel, don't you, — an old-fashioned wheel in a fulling-mill?

A. I never heard it called by that name; I suppose I under-

stand what you mean.

- Q. Never heard it called by that name? It is a very wasteful wheel to use water on.
 - A. It is an under-shot wheel, with plane floats.

Q. Such as they used in old saw-mills? A. Yes, sir. It is a very wasteful wheel.

Q. Now, sir, if such a wheel was used in that fulling-mill, have you any earthly means of telling that it did not use one hundred or two hundred feet of water in the olden time, when water was of no consequence?

A. That is a matter of history; I know nothing about the

dimensions.

Q. Take an old-fashioned saw-mill flutter-wheel, wouldn't it use one hundred cubic under a ten-foot head?

A. I don't think it would. It would not ordinarily be capa-

ble of discharging that amount.

Q. But how much it did, you are utterly at a loss to tell? Now, sir, how much did you allow for the fulling-wheel? In the first place, how much did you allow for the breast-wheel? and, then, how much did you allow for the fulling-wheel?

A. I did not undertake to do anything more than to find the

superior limit of the quantity.

Q. Well, how did you find the exterior limits of the quantity,—

what elements did you take into calculation?

A. The quantity drawn by the water-wheels was ascertained by the openings of the gates that supplied the wheel, and the head acting thereon?

Q. What?

A. And the head acting upon the gates.

Q. That is to say, you gave the gates their capacity, and under the head?

A. Yes, sir.

Q. And did you give any gates their capacity that were not then in the flow?

A. No.

Q. How many cubic feet did that make?

A. 167 or 168, after adding the quantity supposed to be —

Q. How many did that make on the gates? Get that first,—give me those figures. How many cubic feet did the wheels take?

A. (Referring to paper.) That calculation would indicate a discharge of about 159 cubic feet per second. All I can say about that is, that the quantity could not exceed 159 cubic feet per second.

Q. Then what measurements did you take to ascertain how

much the fulling-wheel would take?

A. That was a matter of recollection of parties that had seen it.

Q. Who was the party?

A. I can tell you by searching some papers.

Q. Before you go to that, for whom were you making these

measurements; for the Middlesex Company?

A. So I understood it. The quantity of water drawn by the fulling-mill, the capacity of the fulling-mill was supposed to be equal to about five and one-half feet of breast-wheel, twelve-foot diameter.

Q. How many cubic feet of water per second for that?

A. I found that forty-five feet of breast-wheel discharged not exceeding 158. I find, by my own calculations, that forty-five feet of two breast wheel, would discharge not exceeding 158 cubic feet per second, five feet would discharge one-ninth of that, one-ninth of 158 cubic feet per second.

Q. And that is how much?

- A. That would be about seventeen and one-half feet per second.
- Q. About how much seventeen and one-half cubic feet per second?

A. Something like that.

Q. And the fulling-mill gave you seventeen and one-half cubic feet per second; add that to 159 we should have 167 or 168 cubic feet per second.

Commissioner Russell. 176½?

Mr. Butler. Well, about.

The Witness. I am confounding two measurements; the result of the measurement, as we figured it out at that time, amounted to 167 cubic feet per second.

Q. What was it that gave 167 cubic feet per second?
A. What gave 158 cubic feed per second? That is a separate calculation of my own; 1 took the same data, but made a little correction in the head, that gave you 158 cubic feet per second.

Q. Pardon me, let us get back. How much did you find the wheels made when you get everything as correct as you can

get it?

A. I don't undertake to say that this is correct.

Mr. Shattuck. He has given the outside.

Q. How much do you find is the outside capacity of the wheels that are there now? Let us go back again.

A. I don't think they can draw more than 150 cubic feet per

Q. The wheels that are there now?

A. I cannot say what the wheels there now discharge.

Q. The wheels that were there when you made your calculation?

A. The wheels that were there when we made the calculation could not have discharged much over 150 cubic feet per second.

- Q. Their outside capacity. Show me your figures again, where you got 159; let us see if they vary once in five minutes. You had quite a book here where you had found the breast-wheel 158 or 159.
- A. The calculation made in 1867, in which I took part, showed that when the water was three-fourths of an inch above the top of a fourteen-inch flash-board, at the lowest part of the dam, the quantity of water drawn by the existing wheels would be very near 150 cubic feet per second.

Q. Near how much?

A. 150.

Q, Pardon me, I want to ask you that. Go back to the calculation where you made the possibility of the wheels to take 158 or 159?

A. You want the calculation?

Q. I do; I want your calculation. I don't want everything a theory if I can help it from time to time.

A. Here is the calculation.

- Q. Now what result did they find that the gates would carry? The Middlesex Company wanted to use all the water they could on those wheels.
- A. The result of this calculation is 158_{000}^{76} cubic feet; call it 159
 - Q. Now, then, you took one-ninth of that amount for the full-

ing-mill wheel, which was not then there and had not been since the memory of man, hardly?

A. No, I simply gave you the result of the calculation.
Q. I ask you, how much you added for the fulling-mill?
A. I added water equivalent to 5½ feet of breast-wheel.

Q. What did you make that equivalent to be?

A. That would be equivalent to what I gave you. I think 17½.

Q. I observe you diminished it as much as you could; instead

of taking 159, you divided only 158 by nine?

A. Yes; not with any intention of diminishing the quantity. Q. Without any intention, but was not that the fact? Now, then, you made that $17\frac{4}{100}$. Did you take that for the fullingmill, or didn't you, I don't care a copper which you say?

A. I am simply giving you the result of a calculation, that I do

not place any sort of confidence in myself.

Q. You were there to find out how much water the Middlesex mills had a right to?

A. I was not there as the responsible party.

Q. You were not the responsible party?

A. Nothing of that kind.

Q. Mr. Francis was the responsible party?

A. That was so.

Q. Wasn't he depending on you?

A. He was depending on me to make measurements and computations.

Q. Did you mean that those measurements and computations should be correct?

A. I did at that time.

Q. You did at that time; don't you believe they were correct?

A. I think there should have been a little correction.

- Q. You think now there should be some correction. When did you first come to the conclusion that there should be some correction?
 - A. The first time I had occasion to recall the subject after that.
- Q. And when was that; after you got your retainer from the water-mills?

A. I don't receive retainers.

Q. After you were employed by them — after you were employed by the water men?

A. It was only after I was employed in this case that I had

occasion to examine the subject.

- Q. Then you thought there ought to be some corrections made. What corrections did you come to the conclusion ought to be made?
- A The computation proceeded on the assumption that the water was discharged freely into the wheel. The breast-wheel consists of a series of vessels called buckets, arranged on a large drum, which revolves in close proximity to a circular envelope called an apron or breast. Now the buckets come into contact with that, filled with air, and there is no provision, as I remember it, for the escape of the air. The displacement of the air in those buckets would have increased the pressure under the orifices, which

would amount to a diminution of head. That is a matter that was not taken into account.

Q. Didn't you know that when you made those calculations and

measurements, or was this a subsequent revelation?

A. I understood the principles of pneumatics in some degree then, but, not being the responsible party, my duty was simply to make measurements and computations.

Q. Knowing that trouble at the time, didn't you suggest it to

your principal?

- A. It did not occur to me. If it had, I should have suggested
- Q. Are there any tables by which the amount of that diminution can be ascertained.

A. I do not know of any tables.

Q. Are there any formulas; if so, who has made one?

A. The principles —

- Q. I understand, but any formula laid down in a book for calculating water on the breast-wheel caused by the pressure of
- A. Some of the ablest writers on that subject mention the fact, and say there is a liability to error by not taking account of the air?
- Q. When it was measured for the Middlesex on your measurements, you brought it out about 178 or 179 cubic feet; but, when you measured for these gentlemen in the Boston companies, you bring out only about 167. Now do you mean to say that that air would make ten cubic feet per second difference?

A. That is not correct.

Q. Don't you make it 170 odd, 176, taking your calculation which was made on the measurements in 1867?

A. I make it when I do not take account of the presence of air.

Q. I understand; I do not ask what makes the difference, but when you had it made for the Middlesex, - when you were measuring then for the Middlesex — you brought it up for some reason (I do not ask the reason) at 176 or 177?

A. 167.

Q. No, sir, 177. Giving five feet of breast-wheel for the other wheel, didn't you make it out so, 177 nearly?

A. The result of your calculations you have got.

Q. Then, when you measured it for the Middlesex, you got it 177; now, when you make it against the city, you make it 167 or 168. That is so, is it not?

A. That is not so. Neither of those figures I gave you are in-

tended -

- Q. Neither of them are fit to be depended on in your judgment; is that so?
- A. I mean to say that the quantity could not exceed that amount. That is all I was intending to show.

Q. Well, did you think the pressure of the air from the buckets made ten cubic feet per second difference?

A. I think it is liable to make thirty cubic feet.

Q. On those buckets?

A. Yes, sir.

Q. Do you know exactly what those buckets were?

A. I don't know the exact measurement.

Q. Have you seen a measurement of them since you began to operate for these water-holders?

A. Ever seen what?

Q. Have you ever seen the measurements of those waterbuckets?

A. I have seen the records of those measurements.

Q. Well, now, tell me is there any other reason than the pressure of the air on the bucket, why you think that the wheels cannot take now more than 167 cubic feet, and they could take then 177 cubic feet or thereabouts?

A. I did not state that.

Q. You say this is all they could take then, 177?

A. No, sir; the calculation made in 1867 showed 167 cubic feet per second.

Q. That is the outside capacity?A. Yes, sir.

Q. The calculation you made in 1867 showed 167 outside capacity, did it?

A. That was the result of the computation that was made; it

would not draw any more than that.

Q. Of which the wheels took 159 in round numbers? A. 150.

Q. Pardon me. The outside capacity of the wheels took 159, didn't it?

A. No, sir; that was not the calculation.

Q. That was not the calculation?A. The result of the figures that I made.

Q. Then you did not calculate in 1867, by possibility that the wheels could take 159, did you?

A. No. Q. You are sure about that?

A. The quantity —
Q. Answer that question. Did you calculate by any possibility that the wheels in 1867 could take 159 cubic feet, or thereabouts?

A. No, sir.

Q. You did not?

A. No, sir.

Q. Now, sir, didn't you tell me that you, at that time, calculated the possibility of the flutter-wheel or fulling-mill wheel to be five feet of the breast-wheel?

A. Five feet and a half.

Q. Be it so; five and one-half feet.

A. I did not make any assumption about it.

Q. Didn't you tell me that you calculated the fulling-mill wheel to be equal to five feet of breast-wheel, one-ninth of forty-five feet?

A. I told you that that was assumed.
Q. Very well; then you assume that to be so?

A. I did not say that I assumed it.

Q. Well, that it was assumed to be; but you went into your calculation on that assumption; wasn't that so?

A. The calculation was made on that assumption.

Q. The calculation was made on that assumption. Very well, we have got that down. Now, sir, if you calculated the possibility of the cubic feet of water to be taken by the breast-wheel to be 158 or 159, why, when I asked you what would be the amount of the fulling-mill did you divide 158 by 9 in your own figures? (Showing paper to witness.)

A. The $158\frac{7.6}{1000}$ cubic feet per second is the result of a calculation I have made a short time ago from the data obtained in 1867, and in that calculation I made a little correction for the head. I

can explain it to you if you desire to know.

Q. Pardon me, —

Commissioner Russell. Let the witness answer. I think he

should be allowed to answer as long as he pleases.

The Witness. The orifice through which the water is discharged is the opening between the sliding horizontal gate and the side wall of the flume. (The witness made a diagram.) The head acting on the orifice in the original calculation was reckoned from the top of the gate, or nearly so; I took it from the bottom of the gate. The gate was some inch and three-quarters longer. That added a little something to the head, and increased the result. That makes the difference between this calculation and the preceding calculation.

Q. That makes the difference between them; very good. Do

you want to explain any farther?

A. No, sir.

Q. You are quite satisfied with the explanation; then we will go on with the examination. But I thought you told me that it was the air, and now it is the thickness of the gate that made the difference in the calculation, — the air in the buckets?

A. I did not tell you that it made the difference in that cal-

culation.

Q. In which calculation did it make the difference. I have been on no other calculation except the amount which these wheels will take.

A. I am very careful to say that the results of these calculations indicate the extreme limit that they will draw, and I explained to you why it is probable that they would not draw so much. The real quantity drawn would be considerably less.

Q. Now leave that out entirely, for I have not asked you about it, and I never will, so that you never need to come to that again. But why the extreme limit at one time 158 cubic feet, and why do you give me that as a standard to get at the fulling-wheel, and another time you give it to me less?

A. I did not give it to you. I did not make the calculation for

your inspection at that time.

Q. What? Speak a little louder, please.A. That is not the calculation I gave to you.

Q. Not 158?

A. That was the result of a calculation that I took part in, in a subordinate capacity.

Q. That was the result of a calculation that you took part in?

Is there any calculation here that is not the result of a calculation that you took part in?

A. No, sir.

- Q. Very well. Now what I want to get at is why do the extreme limits of the capacity of the gates appear in your calculation made in 1867 at 159 feet for the gates, and $17\frac{4}{100}$ for the fulling-mill, and now you think the extreme capacity of the fulling-mill and wheels are only 167 or 168?
- A. You are not stating it correctly; 167 cubic feet was the result of the calculation made in 1867, and the other is the result

of the other calculation.

Q. The result of what, was the other?

- A. The quantity of 167 cubic feet was the result of the calculation made in 1867; the quantity of 159 for the wheels and seventeen and something for the buckets, is the result of the present calculation.
 - Q. The result of what?
 - A. Of the present calculation.

Q. Which is right?

A. Neither of them are right.

Q. Now, we will have to go over to the other end of the dam. Did you enter into any calculation to ascertain the capacity of the gates, of all the gates at the other end of the dam?

A. The other end, of Middlesex dam?

Q. That is it.

A. No, sir.

- Q. And why not, if you wanted to find how much water was used at that dam?
- A. I did not want to find out how much was used, at least I was not instructed to do so.
- Q. Wasn't you expected to find_it. Wasn't you sent there to find it?
 - Mr. Shattuck. You mean what he was sent for recently?

Q. What you were sent for at any time — all times?

Commissioner Russell. Mr. Shattuck means to inquire whether in 1867?

Q. What were you sent for to do over the dam. You got one end in 1867, now you went over the other end.

A. To ascertain facts bearing upon this controversy.

Q. What facts were you to ascertain bearing upon this contro-

versy?

A. One thing I was asked to do, was to ascertain approximately, the amount of power called for by the machinery of Stott's mill, and through that the quantity of water called for.

Q. What else?

- A. I do not remember anything else that I was especially desired to do.
- Q. Were you desired to do anything else at all, specifically or generally, particularly, or any other way?

A. It was understood, generally, that I was to ascertain facts

bearing upon this controversy.

Q. Well, what facts. "Facts" is very general; surmise would be a fact; what facts?

A. I think that was the only thing, the only specific thing that I was asked to do

Q. The only specific thing? Did you do anything else; being asked only to do that, did you volunteer to do anything else?

A. I made a good many inquiries.
Q. Did you do anything but inquire?

A. I went inside of the water-wheel at Stott's mill.

Q. That was to ascertain the fact about Stott's water-wheel. Did you do anything else except to ascertain the facts about Stott's water-wheel?

A. I don't remember anything except the water-wheel.

Q. Can you give, within 100 cubic feet, how much water is required to carry the mills at the other end of that dam?

A. I presume I could.

Q. Of any knowledge of what you have now, — not what you can do hereafter, because I don't inquire into possibilities, — but can you tell, now, to-day, that you know within 100 cubic feet per second how much water is required to carry on the machinery of all the mills on that side of the Concord river?

A. Yes, I could say within less than that.

Q. Knowledge, not guess, — I don't ask that; what knowledge have you; what measurement did you make to begin with; what did you measure besides that wheel?

A. I measured nothing else accurately.

Q. What else did you measure inaccurately?

A. I observed the penstocks made for conveying water to the mills.

Mr. Shattuck. He has not been examined about this.

Mr. Butler. Oh, yes, he has. I understood this witness was put on to swear there were only so many feet put on the Middlesex dam, and therefore there should be only so much put on the Wamesit dam.

Mr. SHATTUCK. No.

Mr. Butler. Pardon me; you opened that way.

Mr. Shattuck. This witness was asked nothing about the Mid-

dlesex dam, except the Stott's mill.

- Q. Then I want this fixed now, so it won't alter hereafter. They now don't put you forward as a man who knows anything about it. Do you know anything about how much water was used besides Stott's.
- A. I could not make a very accurate estimate of the quantity of the water used, and have no means of knowing. Do you say at Stott's?

Q. No, sir; at the other end of the dam.

A. No, sir; the whole length of the dam I could not make an accurate estimate of the quantity of water used.

Q. Could you, from any data you have, of your own measurement, make any calculation as to it; not any guesses, but calculation from data of your own; not what other people have told you?

A. No, sir; I can make an approximate estimate of the quantity used by Stott's mill, but take the aggregate that is used on the dam, I have no data whatever.

Q. No data whatever; we will leave that alone, then. Now, sir, you have made the height of the fall at that Middlesex mill. How high were the flash-boards?

A. I suppose thirteen and fourteen inches; thirteen in some

places and 14 in others.

Q. That was to make a level top to accommodate inequalities of the dam?

A. I cannot say what it was for.

Q. Did they make a level top to the dam?

A. I cannot say.

Q. Was the water running over the whole length of the dam? A. It did at times.

Q. When you took the head?

A. I took the head a great many times; I took the height of the surface of the water, below the dam, and above it.

Q. Kept up by a thirteen-inch flash-board or a fourteen-inch

flash-board?

A. The flash-boards used were in some parts thirteen inches, and in some parts fourteen inches.

Q. How much of the length of the dam was fourteen and how much thirteen?

A. I cannot say anything about that.

Q. If the water was running over at all it would make a difference, wouldn't it, about the height of the head?

A. It would make a very slight difference.

Q. Now, then, with a thirteen or fourteen inch flash-board, how

high did you make the water in the top of that?

- A. The water even with the top of that? I don't know as I have any observation when the water was even with the top of the flash-board.
- Q. I want to get, if I can, where you made the limit of the rightful head?

A. The rightful head I know nothing about; I measured the

actual head at that time.

Q. Where did you make the limit of the head, from which you calculated the fall? I take it, in order to measure a fall, you must find some place to start from.

A. Yes. We started from the surface of the water below the dam, and measured to the surface of the water above the dam.

Q. Then, in order to find what the effective head and fall of the mill is, all you have to do is to take the surface of the water at the head of the dam, above the dam, and the surface of the water below?

A. I believe that is what is ordinarily understood by head and

fall.

Q. Well, sir, will you answer my question now? Do you mean to say that in order to find out the effective head and fall on the mill you only have to take the difference of the water above the dam, and below the dam?

A. The mill does not necessarily use all that falls; it might not be the effective fall.

Q. An effective fall that could be used?

A. That would show all the fall that the mill was capable of using.

Q. Without any reference to the actual stage of the water when you took the head and fall, would that be so?

A. It would show the head they were capable of using at that

time.

Q. That is not the question. Whether this measurement of the difference between the water above and the water below would show the effective head of the mill, without reference to the height of the water?

A. No, sir; it would not show an average for all time.

Q. Have you any measurements that will show what is the actual head and fall which a man has a right to rely on, on the Middlesex dam.

A. I don't know anything about any man's rights.

Q. But which a man ought to rely on if he was going to buy it. I suppose, if a man goes and buys a mill, he wants to know what the head and fall is?

A. I do not imagine the head and fall differed very much from

our results during the summer season.

Q. Well, what I want to get at, if I can, Mr. Frizell, is something that you measured from, so that I can verify, if I can, your measurements; but, if you say you measured only for the water

as it was running on a given day, it would be difficult.

A. I can give you the height of the water as compared with known heights at Lowell. On the 20th of September, at half-past eight in the morning, the height of the water just above the dam was $10\frac{55}{100}$ feet above the zero of the locks of the canal scale.

Q. Taking that as the datum?

A. Yes, sir; and the height below the dam was $\frac{76}{100}$ of a foot

below zero. You add those heights in order to get the fall.

Q. That is, you found the water at that date $10^{-5.5}_{-0.0}$ feet above the zero of the locks of the canal scale, which is taken there for a data of low water, and adding the $\frac{7.6}{10.0}$ of a foot which the water actually was at the time below at that data, and you give us how much?

A. $11_{\overline{100}}^{31}$ fall.

- Q. Now, that head and fall would only apply when the water was below the scale which is established there as low water, is it not -- zero?
- A. I don't know as it was established as low water. It is the one which the proprietors of locks and canals worked from in all their levels.

Q. Suppose we want to know what the fair low-water mark is;

that is, working on a level?

A. I don't know that the data was established with any reference to low water; it is reasonable to suppose that it was.

Q. You have no reason to suppose that it was?

- A. I have no reason to suppose that it was established as the low water.
 - Q. Did you get anywhere near the average of the low water?

A. It evidently is pretty near it.

Q. Yes; it happened by accident to get to that position, but

without any design. Finding a thing well adapted to a purpose, you don't infer a design and maker?

A. I presume that it was established with that view.

Q. Now, then, do you believe that with 10-inch flash-boards holding the water at the top of the dam there is more than 10 feet fall at the Middlesex in average low water?

A. With 10-inch flash-boards holding the water at the top of

the flash-boards?

Q. Holding the water at the top of the flash-boards?A. I should think there would be more than 10 feet.

Q. How much?

- A. I should think there would be nearly 11 feet; I should think there would be quite 11 feet during the summer months while the flash-boards were retained.
- Q. Well, we have got this fall established as near as we can. Now, then, we have some measurements for only two years in the very dry months of the flow of the water in Sudbury river. Do you think those measurements, as an engineer, would be of any value to determine the amount of water running in Sudbury river for a series of years?

A. It depends on how long they were continued.

Q. Assuming that we have got already in the dry months, measurements of the water accurately taken in Sudbury river for two years,—and only two years unfortunately,—do you think that that would be a single measurement to found a calculation upon which could be relied upon at all to ascertain the amount of water that would run in Sudbury river in the corresponding months for a series of years; would it be valuable?

A. It would be valuable; I should say that.

Q. It would be valuable; but how valuable? Could you rely upon it with any considerable degree of certainty?

A. It is entirely impossible to predict the flow of the water for

any given year from any data.

Q. Suppose up to Sudbury river that they only got an accourate measurement that you can swear to for one year, and that an exceptionally dry year, would you think that that would be any reliable data from which we can make a calculation of the average supply of water in Sudbury river, on which men ought to act in the high concerns of life?

A. I say that I think it would be valuable.

Q. Do you think it is one upon which you could rely with any certainty to get at the average flow of water?

A. If I was endeavoring to get at the actual flow of water, I

should be very glad to have that measurement.

Q. I agree that it would be an aid. I want to get at — upon a calculation based upon that measurement — what, in your judgment as an engineer, is the fair flow of water in Sudbury river?

A. I understand you to say that the measurement was made

merely for a year?

Q. No; it was measured for a year during the exceptionally dry months, and it unfortunately happened to be in an exceptionally dry year.

A. The result in a dry year would not indicate the flow in an

ordinary year.

Q. That I knew; but what I want is to get your opinion of the value of such facts in getting to the true amount of the water which Sudbury river would supply.

A. I think such a measurement, made in connection with observations of the rain-guage, would be an important aid in determin-

 $ing\ the$ ---

- Q. But would that, by itself, suppose it to be taken in connection with the rain-guage, would you be willing to purchase a water power on the strength of that measurement alone; but made in an exceptionally dry year, in the dry months, what water appeared in it?
- A. I should certainly be willing to take the water-power upon the basis of any such a measurement.
- Q. That is taking that as the maximum; but would you be willing to sell a water-power on that basis?

A. Hardly.

Q. And you think a man would be anything but prudent who should base his action of selling a water power upon such a slender basis?

A. Yes, sir.

Q. Well, I'm very much obliged to you, Mr. Witness. What would you say to thirty days' measurement; that would be worse, that would be one-third as valuable as three months?

A. That certainly does not afford an entirely reliable indica-

tion.

Q. It don't afford any indication at all, does it?

A. It is much better than nothing.

Q. What?

A. It is a great deal better than nothing.

Q. About equal to nothing multiplied by two?

A. It diminishes the uncertainty.

- Q. But you'd hardly expect a man to sell his water-power based on such a statement?
- A. No, sir; but if he hadn't any other indication, it would be the best indication.
- Q. Now, sir, tell me what other indication you have of the amount of water running over Wamesit dam, except thirty days' measurement of the dryest month, in the dryest year that we have had for a long time?

A. I do not understand this to be the dryest year that we have had.

Q. Do you understand any dryer time there has been than between the 24th of August and the 25th of September? Do you understand a dryer season than that for a series of seasons? Do you have any dryer now, in memory?

A. I do not think that was the dryest time there has been for a series of years, by any means. There was two and a half inches

fell at one time.

Q. Well, that is the only thing that fell, isn't it?

A. Nearly.

Q. Now, sir, in the months of August and September, commencing the 25th of one, and the 24th of the other, is not the average rainfall about seven inches, — a fraction less than seven inches, — for a series of years?

A. In the month of August?

Q. Between the 24th of August and the 25th of September. Won't you find that, taking the average of years being about forty-one or forty-two in the course of the whole year, to be about seven?

A. I should think it would hardly be as much as that.

Q. Set it at how much you think the average would be, then we will get at your knowledge of rainfall and gauges. I don't care where you put it, put it where you like.

A. The month of August, I think, on the agerage, shows a little higher aggregate rainfall, a little above the average of the

months.

Q. What is above the average of the months?

A. The rainfall for the month of August.

Q. Is generally above the average of the months of the year, do you mean?

A. That is my impression.

Q. You think the rainfall in August is above the average of the months of the year?

A. I think it is a little above, as a general thing.

Q. How is it in the latter part of September, how is the month of September?

A. I cannot say from memory.

Q. It so happened that all the rain that fell this year was in the month of September, about the 18th or 19th.

A. I think not.

Q. I wish you would give me that; we won't stop now, because you want to speak with accuracy. Give me the average for the last ten years, the rainfall between the 24th of August and the 25th of September?

A. I can do it if you'll wait.

Q. You can do it? I know you can, and I guess with that, I won't have to trouble you any longer.

A. I can't give you that now. In order to do what you have required, I should have to take several hours.

Q. Well, you need not do it until to-morrow morning, if you will.

A. I will give it to you to-morrow morning.

Mr. Butler. I think that will do. One thing—have it on paper, and see it is correct, and we will put it right into the book.

Re-direct examination.

Q. (By Mr. Shattuck.) I understood you to say yesterday, that from your observation you considered the flow of the Wamesit dam 225 feet per second?

Mr. Butler. In answer to who? Not to me, sir. I have not asked him that question.

Mr. Shattuck. No, but that is only a part of the question. It is brought out by your cross-examination; you will see how.

Mr. BUTLER. Well, I have heard this end of it, and to that I

object.

Q. You stated in answer to General Butler, that that was your opinion of the effective flow before the taking; what is your

opinion of the effective flow since the taking?

Mr. Shattuck. (Addressing Mr. Butler.) You asked him as to when he made his calculation, what he took into account before and what since. (Addressing the Witness.) Will you state that?

Mr. Butler. I don't understand that question now.

Mr. Shattuck. You do not listen.

Mr. Butler. Now if you will state the question from the beginning?

Mr. Shattuck. If you will give me a chance to put the whole

of it together.

Q. Now Mr. Frizell, what, from your observation, in your judgment, would you consider the effective flow of the Concord river at the Wamesit dam, since the taking?

Mr. Butler. I object to that question. It is no answer at all to

any question that is put.

Mr. Shattuck. The commissioners will remember that several questions were put by General Butler, bearing on what elements he considered, and whether he was estimating before taking, and whether he got the basis of calculation made, etc., leaving the matter as I thought not quite as clear as it ought to be, and therefore I put this question to him.

Mr. Butler. I have not asked his opinion, however; I have asked him generally as to the amount of the flow. I have asked him questions in regard to the opinion which he gave to Mr. Shattuck. That don't open to a re-examination, by asking his opinion

over again.

Mr. Shattuck. No, I am not asking it over again.

Mr. Butler. Pardon me; you have asked him over again.

Commissioner Russell. I have not a full report of the evidence that has been taken on the point which you say Gen. Butler examined upon. He says, "I made my measurements calculating that the water had been diverted. I calculated the rainfall without deduction for any taking. I made no allowance in the estimate for water having been diverted." That is to say, that he used those elements in making his computation, speaking of the flow before the taking.

Mr. Shattuck. That requires explanation.

Mr. Butler. I am content that he should explain it, but the question is not to call for his opinion; it is not within the legitimate re-examination. I ask a man, "You have given me your opinion about a certain matter. Now," I say, "what elements do you put into that opinion?" He gives them to me. Or, "What did you leave out?" He gives them to me. Then it is not competent on re-examination to ask him his opinion over again.

Mr. Shattuck. I am not asking the same opinion over again,

but to show exactly what his opinion referred to before. That which has just been read by the Chairman leads to obscurity.

Commissioner Russell. If you can direct his attention to that, you can do so; but it seems to me that you are now intending to ask a question which might have been asked on direct examination.

Mr. Shattuck. It would not have been asked if there had not been obscurity created by the peculiar nature of the explanation.

Commissioner Russell. I think you can get an explanation of the answer to those questions.

Q. Well, will you explain then your calculation?

Mr. BUTLER. What calculation?

Q. The calculation from which you got at 225 feet per second as the effective flow of the Concord river to Wamesit mills.

Commissioner Russell. I should prefer to have what he testified to on that point read from the full minutes.

Mr. Butler. I am going to recall him to-morrow.

Mr. Storer. Sufficient has been read to suggest to the witness the explanation which he desires to make; I do not know why that is not sufficient.

Commissioner Russell. If you will call the witness's attention to any answer which the witness made on Gen. Butler's cross-examination.

Mr. Storey. (Addressing Commissioner Russell.) You read just now two passages from his examination.

Mr. Butler. Suppose, for the matter of convenience, Mr.

Shattuck, we will wait until to-morrow morning.

Commissioner Russell. We can probably send for the full minutes of the examination. [The reporter who took this part of the testimony was absent.]

Mr. Shattuck. The only thing I care for is what the Chairman

just read.

Mr. Butler. I would just as lief have any testimony that

you [Commissioner Russell] have got down.

Commissioner Russell. The only minutes I have are, "I made my measurements calculating that the water had been diverted. I calculated the rainfall without deduction for any taking. I made no allowance in the estimate for the water having been diverted."

The Witness. "I made no allowance in the estimate for the water being diverted." My measurements were made — measurements and computations having been made under the impression that the water of Sudbury river has been diverted during the time of my measurements.

Q. Do you mean during, or before?

A. During, while my measurements were going on; that is, that my results don't include the waters of Sudbury river. The estimate of the water available at Wamesit dam assumes that the Sudbury is not diverted.

Q. That is, the 225 feet per second was the available effective

flow before the diversion of the Sudbury?

A. Yes.

Q. How much was it after the diversion of the Sudbury, based on actual measurement?

Mr. Butler. Pardon me: I think that is re-examination.

Mr. Shattuck. I think it is necessary in order to make this

Commissioner Russell. Let the witness state it.

Mr. Butler. Very well, I won't even take an exception.
The Witness. It was thought that the available quantity after the diversion of the Sudbury would be about 180 cubic feet per second at Wamesit dam. This must be understood, that that was the quantity that could be drawn in the daytime under the existing arrangements for drawing it in the night.

Q. It is above the average flow of twenty-four hours, I under-

stood you?

A. Oh, yes.

Re-cross examination.

Q. (By Mr. Butler,) Mr. Frizell, what would be the average flow, in your judgment, of the Wamesit dam in the canal, provided the water was drawn off - was drawn down over night - by using at night so as to be at the level of the stone dam in the morning?

A. I cannot answer that without some examination of my

results.

Q. I wish you would examine that result. Suppose that in practice the water was drawn down overnight to the top of the stone dam so as to leave it at the stone dam at half-past six in the morning, to be used in the daytime by the taking of the water on the canal. It is a question I omitted.

A. I will give you that with the other things that you call

for.

Mr. Butler. Yes, sir, thank you.

Re-direct examination.

Q. (By Mr. Shattuck.) I was going to ask Mr. Frizell to give the average from this (producing map used by the counsel for the city) of the flow between the 6th of July and the 30th of July.

Mr. Butler. We are going to put in the average from the 6th

of July to the 24th of September.

Mr. Shattuck. I know; but I want to have him give it here. You put the map in, did you?

Mr. Butler. There are some other data which we wish to put

Mr. Child. Put it right on the map.

Mr. Butler. Very well, I will withdraw it.

Mr. Shattuck. I don't think you can show a witness a paper, and then withdraw it.

Mr. Butler. I handed it to the witness, and took it right back again. He said that he would rather have the tables.

Commissioner Russell. I think the table was substituted,

according to my recollection, for that, and there is no use for that whatever.

Mr. Butler. I assure you, you will have those data before we get through, because I think the time has come to burst this bubble.

Mr. Shattuck. I think that paper was produced and offered. The witness referred to the table, but the other was not taken back at all.

Commissioner Francis. The witness did not examine it at all.

Mr. Shattuck. He looked at it, and said he should prefer tables, but it was not withdrawn.

Commissioner Russell. He looked at it and said he should prefer the tables, and finally, I think, the paper was withdrawn from the witness.

Mr. BUTLER. I did not object to my brother seeing it, studying and looking it over, but I don't think that made it evidence.

Mr. Child. If you have it in as testimony we want it to go in as perfect testimony.

Mr. Butler. I am content that by and by you shall see it, and that it agrees with your tables.

Mr. Shattuck. Ours begins the 6th July. Is this paper considered in?

Mr. Butler. I think it is. Yes, sir, that is in; he is going to make a calculation from it.

Commissioner Russell. That has been shown to the witness, and he is going to make a computation from it.

Mr. Butler. He is going to make a computation to see if the calculation is right. That is in for any possible use you can make of it.

You do not say that that is evidence? Mr. Storey.

Mr. Butler. Not at all. If you want it as evidence, have it as evidence. If you want it in now, settle it.

Mr. Shattuck. I do not care to decide the question now.

Mr. Butler. Then, at present, it is a calculation which I ask the witness to verify for my own instruction.

Mr. Storey. Assuming that the basis of the calculation is correct?

Mr. Butler. Yes, sir.

Mr. Storey. I did not understand that you offered it assuming that the calculation was correct.

Mr. Butler. No, I did not do that, but I am going to put it in as correct, when I lay a basis with my testimony. Those tables are in from the 6th of July.

Mr. Shattuck. Those are the same as the map. They are more convenient to look at.

Mr. Storey. I desire to have it distinctly understood in regard to facts being proved by the papers.

Commissioner Russell. I do not understand that the papers were in the case as testimony, but they are in the case to be used by the witnesses.

Mr. Storey. I wanted to avoid any possible misunderstanding. We have no opportunity to examine them until they are printed.

LUTHER W. FAULKNER, sworn.

Q. (By Mr. Shattuck.) Have you a mill on Wamesit dam?

A. Yes, sir.

Q. How long have you been employed there?

A. Twelve years.

Q. How often have you been there during that time?

- A. I have been there, on the average, every other day. I made it my rule to go every other day.
- Q. Whether you observed the water, have been in the habit of doing it during that time?

A. I have.

- Q. To what extent; state what opportunities you have had?
- A. The mill is situated within thirty feet of the bed of the river. The bed of the river flows directly back of the mill within thirty feet, and can be plainly seen from all the windows back of the mill.
- Q. Can you tell from that point whether the water is running over the Wamesit dam, or the flash-boards?
 - A. Yes, sir; it all has to pass there at the head of the river.
- Q. I should like your opinion, from your recollection, as to the number of times each year during which the water runs over the Wamesit dam, during the whole of the working day?
 - A. I should think it did not run over more than three months.

Q. During the entire day?

Å. Yes.

Mr. RICHARDSON. Perhaps it would be well to ask him some questions with regard to his own mill, so as not to recall him.

Mr. Child. I do not understand there is to be any distinction made about the evidence; it all goes in to be applied as you like it.

Mr. Butler. It all goes in, and the only question put in by your side is, as to how much the water runs over his dam.

Q. (By Mr. Richardson.) Now, Mr. Faulkner, when you bought, you bought by two deeds, I understand you, which have been put in?

A. Yes, sir.

Q. In the first deed there were two lots of land, a certain quantity of water-power, and in the second deed another quantity to be added upon certain terms, certain conditions to take place afterwards.

Mr. Butler. Conditions of the payment?

Q. Yes. Now, that was limited to three years. Within the time specified in that second deed, did you pay the money to the grantor specified therein?

A. Yes, sir; I did.

Q. Within how long a time after the deed was made?

A. Within one year from that time.

- Q. Did you afterwards enter upon the additional quantity, or afterwards begin to use the additional quantity of water provided in that deed?
 - A. I did.
 - Q. When you bought the land, was there any flume there?

A. Not any.

Q. Won't you state to the commissioners what you did, what

you constructed?

A. I don't recollect the price of the flume; I built it according to the restrictions, that it should be so long, and regularly even sides; those things I complied with in the mill.

Q. Within what time did you construct that?

- A. That was the first year, in the year 1864, that flume was constructed.
 - Q. What else did you do then to improve the land?

A. I built a mill on it.

Q. How large a mill? A. It is 81 by 50, I think. Q. How many stories high?

A. Five stories high.

Q. Did you put in any machinery, and if so, what?

- A. We have put in six sections of machinery. It was not all put in at first.
 - Q. I mean from the time since, and back of two or three years?

Q. (By Commissioner Francis.) Six sets?

- A. Six sets. Some call them sections. It was woollen machinery.
- Q. (By Mr. Richardson.) That was all completed how many years ago; was it two or three years ago?

A. 1872. I think we put the last in in 1872.

Q. Now what time in 1872?

- A. In the winter of 1872. We had but four sets until that time.
- Q. How early did you put in your wheel, after you completed your flume and building?

A. We put it in the same year.

Q. A little after the deed?

A. The same year that we commenced.

Q. At first, how much machinery did you put in, and when did you increase it? It was all woollen machinery, was it?

A. All woollen.

Q. At first, how much did you put in, and how long a time did that go?

A. Put in four sections to commence with.

Q. How long did you run it with four sections? A. I think we run it to the winter of 1872.

Q. You put in the wheel at the time?
A. Yes, sir.

Q. Have you made any change in that wheel?

A. We have changed the wheel once.

Q. When did you make the change in the wheel?

A. Well, I don't know certain as I have that; that is something previous; about 1870, I should think.

Q. How much horse-power does it require to run the six sets of machinery that you now have in?

A. I suppose it took about — I am not much used to such things — I suppose it took fifty horse-power.

Q. In addition to that have you had a steam-power in your mill? if so, how long?

A. We have had some steam-power since the first of January.

Q. (By Mr. Butler.) Since the first of this January? A. The first of January.

Q. (By Mr. Richardson.) Describe what kind; is the steam-

power permanent?

A. No, sir; it is a temporary engine set up within the room where a great deal of help are. It makes it very uncomfortable. We only use it temporarily.

Q. Has it been connected with your machinery during that

time?

A. It has.

Mr. Butler. I think the acts of the parties would be the best evidence.

Mr. Richardson. I only wanted to know what the condition

Mr. Butler. I won't object.

Cross-examination.

Q. (By Mr. Butler.) May I trouble you to ask what your age is?

A. 61.

Q. Born in Middlesex County?

A. Yes, sir.

Q. At Billerica mills?

A. Yes, sir.

Q. Have you always been a manufacturer?

A. Yes, sir.

Q. Commenced your manufacturing at Billerica?

A. Yes, sir.

Q. Commenced at Billerica mills, I suppose, to manufacture?

A. Yes, sir.

Q. At sometime you sold out your connection with your brother who owns the mill?

A. Yes, sir.

- Q. And then you went down to the Wamesit dam and bought this water-power and erected a mill?
- A. Not immediately. I had a business connection with Mr. Harris, of Fisherville, for some years.
 - Q. Afterwards you went in with Mr. Harris, of Fisherville?

A. Yes, sir.
Q. When you quit that business connection you went down here? You have been acquainted with machinery and water-power all your life, haven't you?

 \overline{A} . Yes, sir. Q. And especially have you been connected most of your life with the machinery on the Concord river?

A. I have.

Q Did you know Mr. Whipple?

A. Yes, sir.

Q. Won't you approximate as near as you can how many years since he began on the Concord river at what is known as Whipple's Falls?

A. I could not tell. His powder-mill used to be there.

Q. Wasn't Mr. Whipple there substantially ever since you can remember carrying on the powder business first?

A. Yes, sir.

Q. And there has always been a dam there as long as you can remember? He had a dam under his control?

A. Yes, sir.

Q. Mr. Whipple was a man of ability?

A. I think so.

Q. He died at what age?

A. Rather an advanced age; somewheres between seventy and eighty, I should think.

Q. Died about six years ago, wasn't it?

A. Yes.

Q. And after the city grew up around his powder-mills, so that they were not quite convenient to have there, he built this canal and undertook to sell power to various persons, of which you are one?

A. Yes. I did not buy of him; I bought of Mr. Patch.

- Q. Yes, he sold out to Mr. Patch afterwards. Were you one of the first men that built mills on the new canal?
- A. No, sir; the Chase mills were there when I was there, and the Belvidere on Warren street.

Q. Was the Bolt company?

A. Yes, sir.

Q. Bolt, Chase and Belvidere, and the present mills, with the exception of the new bunting-mill and the carriage factory of the Wamesit Power Company, were there — the old mills?

A. Yes, I think they were.

Q. The canal existing as Mr. Whipple built it until it came into the possession of the Wamesit Power Company, and then it was enlarged, wasn't it; very considerably deepened and widened?

A. It has been enlarged since I have been there.

Q. But was not that after the Wamesit Power Company came into possession?

A. Yes, sir. It first went into the hands of Mr. Patch, then—

Q. Into the hands of the Wamesit Power Company, and then the canal was enlarged?

A. Yes.
Q. And isn't there a great deal more water used now in that canal than there was when you first went there — great additions to the machinery?

A. I should think there was some more.

Q. When you first built the mill, and bought the fifteen cubic feet of water, how many sets of cards did you contemplate putting in when you first calculated your investment?

A. I calculated putting in four sections to commence with. I had the other amount bonded in the meantime, that I would pay

that I could add the ten feet.

Q. You took a bond that you should get the ten feet if you wanted it?

A. Yes, sir.

Q. Calculating that your fifteen feet would do for your four sets of cards, then you thought you would provide for ten feet more. You run your mill on the four sets of cards until 1872?

A. I suppose about 1872. I think it was in the winter of 1872

we added two more sets.

Q. Do you run your sets at any more speed than you used to? A. I don't think that has been changed; I don't know of any change.

Q. You have not speeded up at all? Have built any addition

to your works lately?

A. No, sir. The mill was built in 1864. Q. Haven't you built a new store-house?

A. Oh, a store-house.
Q. I mean additional works. When did you build that?

A. Built about two years ago, I think.

Q. Have you built any other new buildings?

A. Nothing new.

Q. Your store-house is the brick building that we saw near the end of your mill?

A. Yes, sir.
Q. You never have had any adjunct of steam-power until the first of January of this year, have you?

A. No, sir.

Q. Will you tell me how much of the time you have run your mill?

A. I run it most of the time when we had water enough.

- Q. That; I supposed, that, I should not want you to swear to. I want you to tell me how much of the time you have actually run it?
 - A. That I could not tell you without referring to my books.

Q. Will your books show exactly?A. Tell the pay-roll, and how I paid my help.

Q. You did not pay your help when the mill did not run?
A. Yes, sir, we paid our help when it did not run for a quarter or a third of a day.

Q. But when it don't run all day you don't pay your help?

- Q. Now, will you have the kindness to show me your books, and show, ever since 1864, how much your mill has not run all day by water?
- A. I haven't any books with me. The books do not show any loss of time, fractional parts of time. We have to pay our help, or the help won't stay. When we stop a third or quarter of a day, we have to pay the help the same, so that the books would show full time.

Q. I understand; but you don't get my question. Your books will show, will they not, how many full days you have been stopped?

A. I don't know. It is not stated in full days. When the

water is short we draw-

Q. Have you ever stopped a full day?

A. I don't know that we have, unless it was some leakage in

the canal, and stopped for repair.

Q. Then you never stopped to your knowledge a whole day from 1874, down to to day? Well, I don't care about the quarters or halves, summer or winter; that is so, isn't it?

A. I don't think that we have stopped any full days.

Q. Now, then, I take it that you would not have used any more water, or have not meant to use any more water, than you have bought and paid for?

A. I have not intended to.

Q. There came a little controversy at one time between you and the Wamesit Power Company, as to the amount you did use, did there not; and you then had your wheels examined and gauged so as to take the quantity that belonged to you through the wheel?

Mr. RICHARDSON. We don't want to go into that dispute. Mr. Butler. No; I don't want to go into that dispute.

Mr. RICHARDSON. To remove all objection, he did put in a new

Mr. Butler. I am only going to get at the fact that we thought he was using more than he was entitled to, and at a certain time —

Mr. Richardson. I object to its being material evidence.

Mr. BUTLER. I think you will be entirely satisfied. I know the proprieties of the occasion, and do not propose to revive any differences between Mr. Faulkner and ourselves at all.

Q. You did put in a new wheel, and gauged it so as to take, when it was running full, twenty-five feet, as you understood it, and as your engineer understood it. Is not that so?

A. The present wheel?

Q. Yes, sir; the present wheel. You put in the new wheel, and so gauged it according to the best information you could get, so as to take twenty-five feet per second?

A. Yes, sir; we thought we could come at it pretty near.

Q. You tried to do it as near as you could; that is so, is'nt it?

A. Yes, sir.

Q. Now, then, when that water runs down in the canal, do you shut off your works and stop, — then it won't give twenty-five feet per second, so as to get only your part, — or do you run it all you can?

A. We run it all we can. We use the steam for the addition.

Q. You did not have the steam to use until this year. Up to this year, when the water was drawn down in this canal, did you shut off your machinery?

A. Oh! we let our machinery stand; as I told you, we let our machinery stand a quarter or a third of the day and always had to

pay our help for it.

Q. I understand that; but up to the time that you stopped, or was obliged to stop for want of water, did you run all the water that your wheel would take?

A. No, sir; we did not. We stopped a certain portion of the

machinery, and let it stand.

Q. That is what you meant by saying that you could not run a quarter or a third of the day, as the case may be?

A. I made that remark in reference to certain portions of the

day when it draws down worse than others.

Q. Of course you did it only certain portions of the day, when it draws down, but when it does, you say, you stopped a quarter, a third, or a half a day, as the case may be, but the times when you were drawn until you found that you could not run your whole machinery, you kept shutting down until you could; that was so?

A. Yes,

- Q. The water came to you first and you had the first chance at it?
- A. I believe the Wamesit Power Company have two wheels above us.
- Q. That run in low water? Ain't they all rated only to run when the water runs over the dam?

A. I don't know anything about that.

Q. Very well. One is the little shoddy mill that is there, and the other is what?

A. The other one Mr. Carter uses. It takes a pretty good

quantity of water.

Q. I know it does; I agree to that thoroughly. What year do you say now, Mr. Faulkner, that you don't think that for more than three months in the year that the water run over the dam, looking out your window and seeing it?

A. I mean by the average of the twelve years that I have been

there.

Q. Is there any difference now to what there was when you first went there, in that regard, I mean? Does it run over more now than it did then, or run over less now than it did then?

A. I should think it run over less. I recollect in 1854 the water used to creep up before I built the mill; I saw it was higher

then.

Q. How much less do you think it runs over now the top of the dam than it did five years ago, or six years ago?

A. It seems to me it runs over a month or two less.

Q. How much of the year does it run over now, if it runs over, less than it used to six years ago? Take last year, and the year before,—take the last three years,—how much of the time do you think it has run over the last three years?

A. Three months in the year, I should think would cover it, that it runs through the day. It may dash over a little in the morning, and be drawn down while we are at work, or in the

middle of the day.

- Q. I understand. You think now not more than three months, say for the last three years, or last six? How much did it use to run over a year from 1864 to 1870?
 - A. I should think some more. Q. Two months more a year?

A. As much as that, I should think.

Q. Two months more a year it averaged the six years previous; then you would put four months about the average, taking the whole time?

A. Well, I should think, divide the whole time, from the time that I have been there,—the average now, the last few years that I recollect of, I haven't any doubt that it doesn't run over more than three months in the year; but, as far back as that, there was more quantity of water; I noticed it less.

Q. How much time in the year, taking one year with another, since 1872, have you had to stop your machinery on account of water at all, leaving out repairs? You had two or three weeks

repairing one time.

4. The fractions of a day, do you mean.

Q. Any time when you had to stop your machinery for want of water, when you had to stop any considerable portion of the machinery for the want of water?

A. Those fractional parts of days would form a small part of

the whole year. I could not say, paying help in that way.

Q. But I want to get how many different days in the year, will you say that you now know that you have stopped your machinery, any considerable portion of it, for want of water, leaving out the days when you stopped when the canal was broken?

A. I could not say. I have no books or memorandum.

Q. Give us your best judgment, what you will say. "I know so many." What I want to get at is, "I know I stopped two days in the year, I stopped four days in a year, six days in a year, ten days in a year; I cannot say whether I did more or not."

A. I stopped St. Patrick's day, because my help is mostly Irish.

Q. I am now asking for want of water. Get my question. How many different days in a year, any one year, will you swear, when they were not repairing the dam or the canal you stopped any considerable portion of your machinery for want of water?

A. I haven't any memorandum by which I can tell anything

about that.

Q. You can give us some number of days?

A. I have told you I never stopped a whole day that I recollect of.

Q. How many different days will you testify that you have stopped your mill, stopped any considerable portion of your machinery in your mill any part of the day for want of water?

A. I recollect the summer of 1872, or the summer next after the passage of the act, the first time after the water was taken from the City of Boston, — I think I am right in the year — we had quite a number of broken days in the forepart of the summer.

Q. What part of the summer, June?

A. Somewheres between the first of June and last of August.

Q. You had a number of broken days how many broken days that year, could you say that you had between the 1st of June and the last of August?

A. Quite a number, I think; that is the worst summer I have

ever seen.

Q. How many different days that you could say that you are certain you stopped. Of course, you don't know but what there were more?

A. I could not; it would be a mere matter of guess-work to say anything about it.

Q. Ten?

A. I think as much as ten, or more at that time.

Q. How much?

A. As much as ten.

Q. How many in 1873, did you stop for want of water?

A. I could not recollect particularly.
Q. Did you as many as you did in 1872?

- A. I do not think we did. I think it was a wetter season.
- Q. How many did you stop in 1871 as many as you did in 1872?

A. I could not recollect in regard to that.

- Q. Is it your opinion that you stopped as many as you did in 1872?
- A. I do not seem to have any definite recollection about it, only that summer of 1872. I have an impression that the drawing of the water had
 - Q. When they took it from Farm pond to Lake Cochituate?

A. Yes, sir.

Q. Are you ever stopped by back-water?

A. I do not recollect of ever being.

Q. Were there other gentlemen on the same stream with you, using at the same time that you used?

A. What was the question?

Q. Were there gentlemen on the same canal, or other manufacturers running, drawing down the head at the time you stopped?

A. Yes, sir; we were all using partial quantities, but not getting enough. We were running part of our machinery.

Q. You have not told us what that mill cost, the mill itself?

Mr. Shattuck. Including the machinery.

Mr. Butler. The machinery is good anywhere.

A. They were all estimated together.

Q. I only want to know the contract price for that mill and the flume.

A. Reade and Frye call it a pretty solid mill. It commences thirty-two inches at the bottom.

Q. Yes, it is a good mill; I wish I owned it. The question is, how much it cost.

A. I could tell you the aggregate; but the way those mills divide on the machinery, I could not tell you.

Q. I want to know what the mill cost. Well, if you don't choose to tell me, you can't.

Mr. RICHARDSON. I don't think it is fair to say "don't choose."

Mr. Butler. I only say that if you don't say what the mill cost, I can't pay you for it.

The WITNESS. The aggregate of the whole was about one hundred and thirty thousand dollars.

Q. (By Commissioner Russell.) Can't you give the value of the mill separate from the machinery?

A. I cannot.

Mr. RICHARDSON. I want to ask one question, to save the

trouble of recalling him. Among the wheels that were above, he alluded to two; I wish to ask this question as to the saw-mill.

Mr. Butler. That saw-mill never ran except when the water

ran over the dam.

Q. (By Mr. RICHARDSON.) There was a saw-mill that took a vast quantity of water?

A. Yes, about as much as that old flume.

Q. And it has been filled up within what time?

A. Closed up last winter.

Q. (By Mr. BUTLER.) That never was run, except in the spring?

A. I think not; when it was high water.

[Adjourned till a quarter to two o'clock, P.M.]

AFTERNOON SESSION.

Andrew J. Hiscox, sworn.

Q. (By Mr. Shattuck.) What is your occupation?

A. File manufacturer.

Q. Have you had at any time a mill on the Wamesit dam?

A. Yes, sir; I leased a mill there.

Q. How long?

A. For five years. Four years I was on the dam.

Q. Did you build your mill?
A. Yes, sir.

Q. How much power did you have?

- A. I hired eight horse-power. We ran from the same privilege that Mr. Carter runs from.
 - Q. Did you have that all the year, regularly guaranteed? A. No, sir; guaranteed for nine months in the year.

Q. The other part of the time, how was it?

A. We should have it nights; have it nights at any time.

Q. What did you pay for that power?

A. Eight hundred dollars; that is, for the power and the use of the land.

Q. How much land was it?

A. I believe it was one hundred by fifty.

Q. You built your own mills, I understand?

A. Yes, sir.

Q. How near were you to the bed of Concord river?

- A. There was a decent driveway for a horse, and the width of the raceway.
- Q. Did you have an opportunity to observe when the water ran over the dam?

A. I have drove by there four times a day for four years.

Q. Could you tell from the appearance of the bed of the river behind your mill?

A. Yes, sir; I drove right by there. I could not help seeing it.

Q. What is your recollection as to the number of days in the year during which the water ran over the dam the whole day?

A. Well, judging from the water in the stream, — that is the only basis I have to judge from, not from the dam, for I was not very near the dam, — but judging from the water there was in the stream, three months in the year would certainly cover it.

Q. Were you nearer the dam than the Faulkner, or Stott, or

any of the other mills?

A. Yes, sir; we were nearer than the Faulkner or Stott.

Q. Wasn't your power the nearest to the dam?A. No, sir; there were two small privileges above.

Q. Was your attention at any time called to the amount of water, or the effect of this taking with reference to your re-

moval?

A. Well, I heard the reports that the City of Boston was going to take the water, and of course, not having any too much water then, I was anticipating trouble from the City of Boston taking the water.

Q. You stated that three months would cover the time when it ran all day, and you were asked whether you had any special reason for observing the water with reference to removal, or anything of that kind. Did you have any special reason for observing it?

A. Of course the reports affected me more or less. My lease was running out, and the question would naturally arise whether this taking of the water was going to affect my lease; and as I was using my power up to the limit, the question was whether I could renew that lease and have sufficient power. Of course, that naturally arose in my mind.

Cross-examination.

Q. (By Mr. Butler.) You have stated that you had power guaranteed nine months in the year to run eleven and a quarter hours a day?

A. Yes, sir.

- Q. And you used eight horse-power?A. Yes, sir; that is what we hired.
- Q. Drawn from a wheel which was in another building?

A. Yes, sir.

Q. And your attention, you say, was called to the question of the diminution of power by this taking of the water by the city, as to whether you should renew your lease?

A. Yes, sir.

- Q. Did you run all the time when there was water enough to
- A. Yes, sir; that is, there might have been six weeks or two months in the whole four years, I don't think there was that, when we did not run. We run all the time, in fact; we didn't stop any time. We might have run short hours.

Q. Six weeks or two months in the four years?

A. Yes, sir.

Q. The fall of the mill that supplied you was less than the usual fall, wasn't it?

A. Less than the fall below? yes, sir.

Q. Was your attention ever called to the Sterling mill, — what is known as the Charles Stott mill?

A. Not to know anything about it.

Q. To its situation; as to its advantage for taking water?

A. Yes, sir.

- Q. Couldn't that always have water when there was any in the canal?
- A. I don't know much about that. There is one of those privileges where there is a little bend. My attention was called to that, and I thought they were very nicely situated to get the water as it came down.

SAMUEL NAYLOR, sworn.

Q. (By Mr. Shattuck.) What is your occupation?

A. I have had charge of Mr. Hiscox's works for the last six or seven years.

Q. Did you have charge of these works on the Wamesit dam?

A. I did.

Q. What opportunities did you have for observing the Wamesit dam when the water flowed over it?

A. Well, I was around outside about every day.

Q. Could you tell whether water was running over that dam or not?

A. Yes, sir.

Q. What portion of the year should you say it ran over all day?

A. I should think it would reach three months, all day. There were a great many days when it would run over in the morning, and when we started it would run down. That is, some years. There was one year, when we were there, it overran three months, I think, but the other four years it would not.

Cross-examination.

Q. (By Mr. Butler.) You were in the file factory?

A. Yes, sir.

Q. Do you agree with the last witness, who said that he did not think you were stopped for want of water more than six weeks or two months in the four or five years you were there?

A. Yes, sir; I should.

Q. What year was it that you observed that it didn't run over even three months?

A. I don't know as I could state correctly what year it was, but there was one year, I know, that we spoke of as an extraordinary year over any of the others.

Q. When was your attention first called to the fact that your recollection was wanted about the running of the water over the dam?

A. It was, I should say, two years ago. There was a gentleman — I didn't know who he was, or what his business was — came up there and asked me the same question.

Q. (By Mr. Shattuck.) Was that before you left that he asked

you the question?

A. Yes, sir.

Q. And you observed after that, as well as before? A. Yes, sir.

Q. (By Mr. Butler.) What time did you leave?

A. I left Lowell in July last year.

Q. What time did you leave off working there?
A. In July last year.
Q. What time of the year was it this man came?
A. It was in the spring.
Q. The spring before you left?
A. Yes, sir, of the same year that I left.
Q. You left in July, and he came in the spring?

A. Yes, sir.

Q. (By Mr. Richardson.) Did the six weeks or two months cover a period of four years or five years?

A. Four years. I was not there but four years.

Mr. Hiscox, recalled.

Q. (By Mr. Shattuck.) Did you run in the night?

A. Yes, sir.

Q. How much of the time do you think you run in the night?

A. I can't tell anything accurate at all. We couldn't run advantageously in our business nights, and if business was dull we would stop rather than run nights. Probably we might have run three or four weeks during the time nights. I should not think more than that. Sometimes we stopped our works.

Q. How much do you think you stopped running, or run less

than the whole amount, for want of water?

A. There was never a time that we run nights if we didn't run daytimes.

Q. How much of the time do you think you did not run your whole machinery the whole day because you were short of water?

A. I should think four to six weeks.

JOHN STOTT, sworn.

Q. (By Mr. Shattuck.) Where do you reside?

A. Lowell.

Q. What knowledge have you of manufacturing? How long have you been engaged in it?

A. I have been employed by the Belvidere Co. for fifteen years

as book-keeper.

Q. Do you also look after the running of the mill?

A. Not directly, but indirectly.

Q. Well, at times? A. At times I do.

Q. When, and to what extent?

A. In the absence of those in higher authority.

Q. Did you ever work in a mill?

A. Yes, sir.

Q. How long a time?

- A. When I was a boy, up to the time I was fifteen years of age, I worked in a mill.
 - Q. Do you understand the machinery and the running of it?

A. Yes, sir.

Q. Excluding the present year, how much of the time has your mill (Belvidere No. 1, which is not on the Wamesit dam) used steam as auxiliary, from your recollection?

Mr. Butler. What has this to do with the Wamesit dam?

Mr. Shattuck. It has something to do with the flow of water in Concord river.

Mr. Butler. You do not ask him what time they could not run in consequence of being short of water. You ask him what time they used steam.

Q. You use steam simply when you are obliged to, don't you?

A. Yes, sir.

Q. Leaving out the present year, what I want you to state is

the time you have used steam from the want of water.

A. From the absence of any record being kept of it, I can only give it as opinion, from my best recollection. I don't make a positive statement.

Q. I understand. State your best recollection.

A. You mean how much water it aggregated for the year?

Q. Yes, sir; previous to this year.

A. Well, I should say, perhaps from four to five weeks we used steam occasionally. It would aggregate that, I think.

Q. How much steam-power have you? What is your engine?

A. We have a sixty-horse Corliss engine.

Q. Whether with your boiler you have more or less than that effective power that you can use?

A. Yes, sir; if we had any use for it. Q. How much more, do you think?

A. Well, we have what is called a locomotive tubular boiler. It would drive considerably more machinery than what we have. I can't say how much.

Q. Let me ask you, when you use steam as auxiliary, what

amount have you practically used at different times?

A. Sometimes we have run the water-wheel in combination with the steam-engine. It would be a hard matter to say. It might be two or three horse-power, and it might be ten horse-power; and sometimes the water would be so low that we would throw the wheel off, and run entirely by steam.

Q. What portion of the day do you run steam?

A. That depends on the water.

Q. I mean, practically, — one hour, or all day?

A. Sometimes we start up in the morning at quarter of seven, bell time, and there will be water enough to run, and we should not run the engine. Then in an hour's time after that, or a half-

hour's time after that, the water will run right down, and we have to put on steam.

Q. When you start steam in the morning, how does it work?

- A. Those things are governed by the water we find the day before, and if the prospect for the next day is that we must use steam, the order to the engineer is to have the steam up ready to run the engine in the morning; and if, after we have run the engine for an hour or two, the water comes down, as it often has come down, the steam we have got up would be of no account. We don't need to use it.
- Q. Practically, how much steam is required when you are using the smallest amount?
- A. If we have got to get up steam at all to run the engine, it makes no difference in the expense of fuel; that is to say, it costs as much to make a fire under the boiler to make steam for that engine, not knowing how much we would have to use it, as it would if we were to run all day.

Q. Can you illustrate that by any instance within a day or

two?

A. Yes, sir. One instance yesterday. Day before yesterday the water was in such condition that it appeared that we should be obliged to use steam, and the order was to get up steam to run the engine, and we had a fire on purpose for steam for the engine; and I think they ran it an hour and a half or two hours, and then the water came, so that the engine was not wanted.

Q. How much coal do you use?

A. Well, it takes somewhere in the vicinity (not having the exact figures) of a ton of coal to start the fire and run the steamengine.

Q. If you wanted twenty horse-power for all day, how much

more coal would it take?

A. No more at all. We should not have to get any more fire.

Q. Practically, then, if you have to furnish any auxiliary power, you must use fuel enough to provide pretty large power—is that so?

A. Yes, sir.

Q. And if you have to provide it for any part of the day, you

must provide fuel enough substantially for the whole day?

A. Yes, sir, substantially speaking, the whole day. You can't tell when the water is going down, and, unless you want to stop the machinery entirely, you must have steam to take the place of the water, and to do that you must have fire under the boiler.

Q. Could you tell practically any day this last summer, with a few exceptions, in the morning, whether you would need steam

all day or not?

A. Well, yes, we know as well as we can know anything that is to come during the day, that we wouldn't need it all day. Well, there have been times, especially during this year; we have used the steam probably more this year than for a number of years past. We have hardly put the water-wheel on at all; sometimes scarcely drawn water enough in the morning to do the pulling at times this year.

Q. How much steam have you used during the last few months? How long a time?

A. The first part of this year, in January.

- Q. During this year, how many months should you say you had used steam in all?
- A. Giving it as my opinion, I should say we had used it three months this year altogether. That is my opinion. I shouldn't swear to it. The month of January we used steam, and, if my memory serves me right, it was pretty much so the month of February, and parts of the time since.

Cross-examination.

- Q. (By Mr. Butler.) Does ice trouble you? A. Yes, sir, sometimes anchor-ice bothers us.
- Q. Why do you say you have used steam most, because there was back-water, or because you were short of water in January and February?

A. We were short of water.

- Q. How much of the time have you been troubled with backwater?
 - A. We are troubled, more or less, on account of back-water.
- Q. Your uncle is the superintendent, and has the care of the two mills of the company, does he not?

A. Yes, sir.

Q. And has had for a great many years?A. Yes, sir.

Q. Indeed, he was the founder of the whole concern?

A. Yes, sir.

Q. Where is he now?

A. He is at Lowell, at the mill.

Q. Mr. Stott, how many sets of cards have you got at Belvidere No. 1?

A. Seven set.

Q. And you make flannel?

A. Yes, sir.

Q. How many horse-power do you calculate to a set?

A. The mill was originally started for six set. We brought one set down from mill No. 2, but previous to that, in hearing any talk about it, it has always been rated at fifty horse-power to drive the mill and whatever belongs to it. Now, it is more. We have got another set there, that is, one set of cards only, not any other machinery with the one set. I have always heard my uncle and the rest of the managers speak as though it was fifty horse-power to drive the mill. I never made any calculation myself.

Q. How much of the time in any year do you think the water

is running over the Middlesex dam?

A. The water runs over the dam, — I scarcely ever saw it but what it did run over the dam somewhat; that is, some portions of the day. I have seen it when it would be very slight indeed. There may be days when it doesn't run over, but I don't seem to recollect. There may have been days when it has not run over. I presume there are days when it doesn't run over at all; I have no occasion to take any record of it.

Q. It has been where you could see it?

A. No, I couldn't see it without making an effort to see it. I should have to go out of the counting-room because it is not in sight from the counting-room.

Q. Now, in your judgment, how many times in a year has it

run over all day the past five years?

- A. I can't say. I can't give any idea of it at all. I won't undertake to say, because I have kept no record of it, never given it a thought.
- Q. Doesn't the water run over the dam so that you can run your machinery fully by water-power in mill No. 2?

A. It has to run over the dam or else we can't run.

- Q. Then, whenever you can run all day, the water must be run ning over the dam?
- A. If we can run all day, the water must run over the dam. Allow me to say that the water may run over the dam for one hour, start to run over, and then we have certain marks there which tell us, without going to the dam, whether it is running over or not. Then, when the water gets up to that mark, we put on the wheel. We might run an hour, and it might run down below that mark and we would have to stop. If it was stopped at the other end, and the water was not coming down, we should draw it right down.

Q. You have no storage pond?

A. No, sir.

Q. I want to ask you another question about! the other mills. What other mills are carried by the same water, by the same end of the dam; I mean owned by anybody. In the first place there is mill No. 1. Is there anything else owned by the Belvidere Co.?

A. John Holt, he draws water from the same pond. The Nesmith heirs own a building, and they draw water from the same pond, and there is what we call the Island mill, owned by the Middlesex Co. that the Belvidere Co. leased on purpose to control the water. Then there is what we call the Batting-mill property which the Belvidere Co. own.

Q. What else?

A. That is all I know of.

- Q. And they have all an equal right to run when you run? I don't mean an equal amount, but an equal right to run when you can run?
- A. They have the right to run when the water is running over the dam.

Q. And that is your right?

A. That is our right.

Mr. Shattuck. The deeds will show what the rights are.

WITNESS. You don't understand me as answering what the rights are.

Q. How do they exercise their rights? They exercise the right

to run when the water runs over the dam, don't they?

A. That is it.

Q. What does Mr. Holt do?

- A. He manufactures flannel, and has been manufacturing bunting this summer.
 - Q. How many sets of cards does he run? A. I believe it is three; I am not sure. Q. Do the pump-making people run there?

A. No, sir.
Q. They used to?
A. They did use to. He bought that property.

Q. Who runs the Nesmith heirs' mill?

A. White Brothers & Kilburn.

Q. What do they do?

- A. Manufacture leather. There is a different process with the skins. I don't know hardly what you would call them. Tanners. They make glove leather, organ leather, and all such fancy leathers.
 - Q. What is done in the batting-mill, as it is called?

A. Freeman Brown is there now.

Q. What is he doing?

A. He is making fancy lathes for boys and girls. I don't know how to speak of it exactly.

Q. How much power is the batting-mill entitled to?

A. I don't know.

Q. You don't know what the capacity of its wheel is, do you?

A. No, sir.

Q. Nor what the capacity of the water-wheel of the Nesmith heirs is?

A. No, sir, I do not.

Q. Nor what is the capacity of John Holt's wheel?

A. No, sir.

Q. How much does the Island mill take?

A. All I know about that is hearsay; that it is reckoned a twelve horse-power privilege. That is what I have heard it spoken of. I don't know whether it is so or not.

Q. What does the Belvidere Company do with that Island mill?

- A. Nothing. They rent it to Whitehead & Atherton, machinists.
- Q. (By Mr. Shattuck.) Does Holt run all his machinery much of the time?

A. No, sir; He runs very irregularly, - very irregularly, indeed. It is a good while since he ran all his machinery.

Q. Belvidere No. 1 has nineteen twenty-fifths of the surplus

water?

- A. Yes, sir; there are twenty-five rights on that side of the river, and the Belvidere Company owns nineteen of them.
- Q. (By Mr. Butler.) In other words, Mr. Holt is sometimes manufacturing, and sometimes he is not?

Q. Does he cease to manufacture because he has no water?

A. That I don't know.

FREDERICK FAULKNER, sworn.

Q. (By Mr. Shattuck.) Do you have business on Wamesit dam?

A. Yes, sir.

- Q. What do you do?A. Manufacture woollens.
- Q. You are in business in connection with your father, Luther W. Faulkner?

A. Yes, sir.

Q. How long have you been in that mill?

A. I have been in it since it has been built, twelve years. I was there about a year before that, and looked after the building of it nearly a year.

Q. How constantly are you there?

A. I am there every day; very rarely away from there.

Q. What opportunities have you of knowing when the water runs over Wamesit dam?

A. The bed of the river runs right back of where my business calls me a great many times in the day.

Q. Is it a matter of hourly interest with you to see the flow of

the water during most of the year or not?

A. Well, it has been for a few years past, but I have been obliged to see it. It has been where I couldn't help seeing it in passing in and out of the mill.

Q. Your mill is sometimes short of water, isn't it?

A. Yes, sir; somewhat slightly.

Q. And during what portion of the year, what number of days in the year, do you think the water runs over the Wamesit dam, during the whole working day?

A. Not over three months.

Q. How positive are you of that?

- A. It is a thing I have observed constantly, and my business calls me in contact with it every day makes almost a certainty of it.
- Q. (By Mr. Richardson.) I wish to ask you if your buildings substantially cover your land.

A. Yes, sir; we have no spare land at all.

Q. Could the engine that you have be used permanently, or is

it only a temporary affair?

- A. It was only put in as a temporary affair. It would not be practicable to use it as a constant source of power. It is in a building right in our main building, and it could not be practically used.
- Q. Would it be difficult to put in your mill an engine of ten or fifteen horse-power?

A. It would not be possible to put an engine in the mill itself.

We have no land.

- Q. You could put it inside the building by parting it off, I presume?
 - A. We have no room; the place where we have it now is incon-

venient, and the help do not like to work there. It heats up, and is very troublesome.

Q. Have you made an estimate of what it would cost to procure

land and an engine of fifteen horse-power?

A. Yes, sir; I have.
Q. Have you had some experience in running this engine?

A. Yes, sir.

Q. Have you made inquiries as to the cost of land, engine, etc.? Mr. Butler. I object. He is not an expert. You might as well bring a man who has run a threshing-machine out West.

Q. Do you know the cost of putting in the engine you have got

there?

A. Yes, sir.

Q. And you have made inquiries as to the cost of a new one?

A. Yes, sir.

Q. And you have been familiar with the running of the engine you have used?

A. Yes, sir,

Q. And you know the value of land in the neighborhood, do you?

A. Yes, sir.

Mr. Richardson. I propose to put his estimate in, with what experience he has had.

Mr. Butler. I do not see that it comes within any possible

Commissioner Russell. We do not think he is qualified as an expert as to the cost of steam-engines, because the inquiries could be made by any one, of course, and if he is an expert, you could easily qualify any one by setting him on inquiry.

Mr. Butler. I will help you in one matter, brother Richardson. I will ask him, when my turn comes, what this engine cost.

Cross-examination.

Q. (By Mr. Butler.) What did this temporary engine you put in there last January cost?

A. It cost \$400.

- Q. That includes everything?
- A. No, sir; that is the cost of the engine.

Q. Did not the boiler go with it? A. We did not put in any boiler.

Q. How many horse-power does it furnish?

A. About ten.
Q. You hitch it on to the heating boiler?

A. Yes, sir.

Q. How many whole days have you run that engine since last January.

A. I have no record of it, but we ran it several days this

Q. "Several" may mean two, and it may mean five; how many days would you say you have run that engine this summer?

A. Perhaps for two weeks this summer.

Q. Will you say it has run for two weeks?

A. Yes, sir.

Q. Has it run since January more than fourteen days?

A. I can't state the exact number of days, - there have been some parts of days.

Q. Will you say it has run fourteen different days?
A. Yes, sir, I will.
Q. More than that?
A. I can't say for a certainty.

Q. Can you tell me whether you have been troubled with backwater this year?

A. No, sir.

Q. What speed do you run your cards?

A. About ninety revolutions.

- Q. How high do you speed up your spinning?
 A. The ordinary speed of woollen machinery, such as millers recommend.
- Q. They recommend now a good deal more speed than they did a few years ago, don't they?

A. I think they do not, in woollens.

Q. You think you haven't speeded up any in twelve years?

A. We have not.

LUTHER W. FAULKNER, recalled.

Q. (By Mr. Richardson.) Have you had any experience in putting up and running a steam-engine?

A. I had a great deal of experience at Billerica. Q. How many years?

A. Fifteen or twenty years. Q. Down to what period?

A. Down to about twelve years ago.

Q. And during that time, did you become acquainted with the cost of power, the cost of producing, and how you produced it?

A. Yes, sir.

Q. Now, are you acquainted with the price of coal, and the cost of putting in steam-engines, etc., so that you can give an estimate of what it would cost to put an engine of fifteen horse-power, and procure the land at your place for it? Have you made an examination and inquiry, so that you feel competent to give a fair estimate of what it would cost to do it there?

A. I have.

Mr. Butler. I want to ask a word or two about the expertness of Mr. Faulkner.

Q. You say you have been acquainted with a steam-engine at Billerica, — more than one?

A. Yes, two or three different engines, in the course of twenty years.

Q. When was the last one bought that you had anything to do with?

 \mathcal{A} . The one that is there now I have no acquaintance with. Q. When was that put in?

A. I don't know when that was put in.

Q. Twenty years ago?

A. I know nothing about that engine at Billerica, any further than it is not the one I used to work on.

Q. Did you put in the one that is there now?

A. No, sir; I did not.

Q. How many years ago was the one bought that you used to work on?

A. I don't recollect exactly those dates.

Q. 1840?

A. No, not so long ago as that. I don't know but the first one was. I used a steam-engine there for twenty years.

Q. That is, you did not undertake to run it yourself, only it

was run in your mill, in which you were a joint owner?

A. Yes, sir; I had charge of it; I didn't have an engineer.

Q. Did you buy this steam-engine that you have got in there now in your mill, — did you buy it yourself?

A. Yes, sir.

Q. You yourself made a bargain for it?A. Yes, sir, I did; it was a second-hand engine.

Q. Have you ever bought any land since you made your first

purchase with water-power there at the Wamesit?

A. We have bought some from the company, but the last time we made inquiry of the agent of the Wamesit Company, he told us-

Mr. Butler. Never mind what he told you. You made inquiry what you could buy land for, and he gave you some figures. I object that this gentleman is no more competent than the other, and not quite so much.

WITNESS. The estimates I have taken from the engine-builders, and the coal I took from the price of a cargo I have just put in.

That will show how I get at those things.

Mr. Butler. I take it anybody else can make those inquiries

as well as this gentleman.

Commissioner Russell. I suppose Mr. Faulkner may be a judge of the cost of coal at the Wamesit dam; but I do not see that he is a judge of the cost of an engine, or that he is specially qualified to judge of the cost of land. It is evident he intends to give us the price he found he could get it for upon inquiry, and not an estimate of the value of it.

C. B. SNYDER, sworn.

Q. (By Mr. Storey.) You are the owner of the Chase mills?

A. Yes, sir.

Q. How many sets of machinery are there in it?

A. Ten sets.

Q. And what class of goods do you manufacture?

A. Fancy cassimeres.

Q. Does the machinery that you use for the manufacture of those goods require more horse-power than the machinery that is used for the manufacture of flannel?

A. Yes, sir.

Q. About how much horse-power is required for each set of

fancy cassimere machinery?

Mr. Butler. You need not go into that. You have about forty-eight feet, haven't you?

WITNESS. Yes, sir.

Mr. Butler. We will give him about ninety-six horse-power.

A. It is estimated at ten horse-power to a set.

- Q. Has your mill room for more sets of machinery than you have there now?
 - A. There is room for five sets more.

Cross-examination.

Q. (By Mr. Butler.) Have you ever had your power weighed by a dynamometer?

A. Not that I know of; I never have had it done.

Q. Didn't you have it weighed at the time we had some trouble about the water, or didn't you own it at that time?

A. I never had any trouble about any water.

Q. You estimate that the ten sets required ten horse-power each?

A. Yes, sir; I don't say that it requires that absolutely; but

that is the general estimate.

Q. In practice, is there not about four or five horse-power out of a hundred always stopped for repairs or something else, so that ninety-six horse-power will really do the work of a hundred.

A. I don't know that to be the case. It is sometimes the case

that part of the machinery is stopped.

Q. But, as a rule, isn't there about that percentage?

A. I think not.

Q. You have a steam-engine there?A. Yes, sir.

Q. Did you put it in?A. No, sir.

Q. It was put in before you came?

Q. Leaving out this year, before the first of January, how many days did you run the steam-engine?

A. I don't know; I have not the means of knowing.

Q. Does anybody know about your mill?A. I don't know as to that; there may be somebody.

Q. Is there any evidence to show; were any books kept? A. Not that I know of.

- Q. Do you heat from the same boiler that you run your engine?
- A. We have four boilers, two of them connected. We use them for power. Two of them are connected, and the other two are connected.
- Q. Do you make steam from the same boiler, connected with the same pressure, for heat, that you do for running your engine?

A. The boilers are used sometimes, you know, when we run the engine.

Q. What I want to know is, do you run your engine and heat from the same boiler, at the same time?

A. What heat do you mean?

Q. To heat your mill, and to heat your dyestuffs?

A. We only run two boilers when we do not run the engine. Sometimes we run three, but, as a general thing, we only run two.

Q. You run two boilers for dyeing and heating purposes, and two for heating the engine?

A. Yes, sir; in very cold weather we run more.

Q. How much of the time have you heated up those two other boilers?

A. I don't know; I don't go there every day.

Q. Is there anybody who does know?A. I presume there is; but I don't know.

Q. Didn't you ever inquire?

- A. I inquire almost every time I go how the engine has been running.
- Q. Do you depend upon the memory of the man, or does he keep some record?

A. There is no record that I know of; never has been.

Q. Can you say that you ran the engine, prior to this year, sixty days in any one year?

A. I can't say anything about it. Sometimes I am not there

for a week or ten days at a time.

- Q. But inquiring every time you went, I thought you might know?
- A. If they say they are not running the engine, that is the end of it.

Q. Is your wheel rated to take your full power?

A. The wheel is rated exactly to the amount that I am entitled to; that is, I gave it to the man that built the wheel.

Q. If he followed out your directions, it is.

A. Yes, sir.

Q. Now, suppose you are running your mill, and the water goes down, but still leaving your gate untouched, there is water enough to keep your mill running, what do you do?

A. Why, we run it, of course.

FREDERICK FAULKNER, recalled.

Q. (By Mr. Richardson.) Were you present when your father paid the money provided for in the deed, \$3,000, when you got the additional water?

A. Yes, sir.

Q. Within what time from the date of the deed was it paid?

A. Within one year before the mill was started.

SAMUEL N. WOOD.

Q. (By Mr. RICHARDSON.) How soon after you bought the land did you go to work, and what did you do?

A. I think I bought the land in 1862, and built the mill in 1862, '3.

Q. When did you put in the flume and the wheel?

A. The same time.

Q. How did you construct the flume, — according to the requirements of the deed?

A. Yes, sir; Mr. Richards had the supervision of it. Q. Have you been in occupation ever since?

A. Ever since.

Q. For what machinery?

A. For machinery suitable to run a grist-mill.

Q. How much power does it take to run the grist-mill?

A. I think about twenty horse-power. We have got another run of stone, but we only run one run of stone at a time.

Q. You have another run besides that?

A. We have two run of stones, small ones, so that when one gives out we can use the other.

Q. And also an elevator?

A. An elevator and a bolt for bolting meal.

Q. Could you supply steam in the mill for any portion of that, do you think?

A. No, sir, we couldn't use steam at all.

Q. You would have to lose the benefit of the water you lost in connection with your building?

A. Yes, sir.
Q. Why couldn't you use steam?

A. We couldn't compete with water power in grinding. Q. Do you know when the Bleachery put in their flume?

A. I think the same year.

Q. When did Whipple commence making the canal spoken of in the deed, and how soon did he complete that canal down to the northerly line of the Bleachery?

A. I think it was in 1863.

Q. Was it going on while you were building?
A. I think he was building, —I know he was building at the same time I was building mine, and he had it so I could enter.

Q. When the canal was full could you run all the power your machinery required; was there water for that purpose?

A. Yes, sir.

Q. When it was up to the top of the dam? I am supposing that, starting in the morning, when nobody had been using it, taking it any time that the canal was full, was there water enough to run your machinery? Did you get water enough at your mill to run your machinery when the canal was full?

A. Yes, sir.

Q. Would it deliver enough to run your machinery?

A. Yes, sir.

Q. I mean, from there down, would it convey the water, if it was not taken away before it got there?

A. I don't know about the capacity of the canal; I am no en-

gineer, but I suppose it would.

Q. I will ask your practical knowledge, with what water there was in the canal could you run your mill?

A. Yes, sir.

- Q. How low would the water have to flow so that you could not run at all?
 - A. I can run that wheel when it is two feet in the canal.

Q. How deep is your canal?

A. Six feet. I should think it six feet or more.

Q. Was the water ready, down to the Bleachery line, to be delivered to the canal as soon as it was at your land? Did they go on digging and complete it?

A. Yes, sir.

Q. And you could use it together?

A. Yes, sir.

Q. When the commissioners were up there, there did not appear to be any water running to your mill whatever, — you were there?

A. Yes, sir.

Q. I want to know if at times, years ago, such a condition of things took place?

A. Well, sir, it has been so at times ever since I have been

there, you might say.

Q. Were the other mills running at the same time when this would occur?

A. Yes, sir.
Q. Was there any other obstruction in the canal that you know of that would prevent the water coming down to your place had it

not been used up before it got there?

A. No, sir; I have at times when the canal was dry walked over it; I have gone up the canal and found the other mills running, and I have been up at the dam to see where the water was, and it was up to the permanent dam at that time.

Q. Did you, instead of asserting your right to the use of the water above, or settling the controversy, make, with those who held the Wamesit power land then, any arrangement that you should run at any other times, so that it would be unnecessary to settle the controversy?

A. When Mr. Patch was in possession there, we made an arrangement to run nights, and he paid my miller extra for

doing so.

Q. When the water is low in your canal, and plenty of it up there, have you taken your share at night, so that they might use the portion that you claimed belonged to you in the daytime?

A. Yes, sir; and when they shut down at noon we can get water; and the men would get up there, perhaps, at five o'clock in the morning, before they would begin running, and run as long as they could.

Q. Run how long?

A. Just according as the water will keep up. Sometimes they would shut down at nine o'clock, and then they would run from twelve to one or from one to two.

Q. That is, while the other mills were shut down?A. That is, while they have gone to dinner and shut down. We would run so that we could get out the quantity of meal we needed which we wanted to use. We would run as little at night as we could help.

Q. Only when you couldn't get water daytimes?

A. Yes, sir.

Q. You grind and sell your own meal?

A. Yes, sir.

Q. Practically, among the Wamesit Power Company and all the other mill-owners above, there has never been any particular settlement as to the division of water among them, has there?

A. Not that I am aware of.

Q. Is the flume of the Wamesit Power Company lower than the bottom of this canal?

A. Yes, sir; than the bottom of our little canal.

Q. Was the canal any higher when it was constructed, except the wash of gravel anywhere below, than it was at the Wamesit outlet?

A. I don't understand.

Q. I mean, supposing this canal was constructed to take the water that stood in the canal opposite the Wamesit flume, would it have flown down to your place?

A. Yes, sir.

Q. Has there been any obstruction except the wash of gravel in the stream?

A. No, sir.

Q. Has there been any other obstruction than what we could see?

A. No, sir.

Q. Where is the largest obstruction in the canal caused by the

wash, before it gets to you?

A. Well, it is along by the cartridge shop, and down as far as The whole of the canal has been filled up more or less in the construction of the cartridge shop and the water works.

Q. The water of your wheel, would it formerly have drawn the

canal dry clear down to your place?

A. Yes, sir.

Q. As the water turns into the flume of the Wamesit it makes an eddy, don't it?

A. It does.
Q. Whether or not there is more gravel there than at any other place?

A. There is enough there to stop the water from going into that canal, and then there is more or less in the canal.

Q. How long would it take, in your judgment, to clear out the gravel so as to make it as it was when you could use all the water?

A. Two or three days.

- Q. Give the size of your canal, below the Wamesit, down to the northerly line to the Bleachery dam, where it enters their flume.
- A. I never measured it, but I should say it was about six feet deep and eight or ten feet wide. I don't know but it is 12 feet wide. I never measured it. This is merely as far as my judgment would go.

Cross-examination.

Q. (By Mr. Butler.) How many men would it take two days to clear out the gravel of your canal that has washed in?

1. If they were smart, and worked well, I should say two men,

in three or four days, would clean it out well.

Q. You never have done any cleaning, have you?

A. No, sir.

Q. You have suffered this inconvenience for some years, haven't you?

A. I consider that I have no right to enter the canal to clean it

out, only at the head of my flume.

Q. Nobody has ever objected to your entering to clean it out?

A. No, sir.

Q. You don't own the canal-bed? Your land does not extend to cover the canal-bed?

A. No, sir; up to the canal.

Q. When you first put in your wheel, you put in a 25 horse-power wheel, didn't you?

A. No; I put in a 40 horse-power; larger than what was neces-

sary.

Q You put in a 40 horse-power wheel, and then we brought a bill in equity against you, and you fixed a wheel which covered about twenty, didn't you, or meant to?

A. Yes, sir.

Q. Then you used to run the full power of your wheel, didn't you, when there was water enough?

A. No, sir; I stop on it.

Q. Since that time, the Wameset canal, the canal opposite the Wamesit Company, was so up along towards Stott's mill, had been cleaned out and deepened?

A. The upper canal had.

Q. So that practically your canal is higher than the canal coming down to it?

A. No, sir; it has been widened up there, I suppose. I don't

know that it has been deepened much.

Mr. Butler. I guess they cleaned it out.

WITNESS. Well, there is need enough of it. I am not aware that they have cleaned it out. I only know that when there is any water up there, it comes down and I can draw it.

Q. What happens to you is this: The neighbors above, some of them, really carry off all your water: isn't that it? They for-

get to shut down the gates when the water comes down?

A. I don't know anything about that. I know the water don't

come down to me.

Q. When there is water enough, practically, at the gates, if it was divided properly, when it gets down to you, it is gone? That is, when there is a full pond?

A. Yes, sir,

Q. And to remedy that evil, so far as the Wamesit power was concerned, they told you you might run nights?

A. We have tried to accommodate them when they are short of

water. All we want to do is to get our meal out. We can run nights better than you can, because we can run quietly; but there is a great deal of inconvenience in running nights. Our customers come for us, and the millers have to sleep daytimes. There is considerable inconvenience in running nights.

Q. But there is always water enough there to run nights, isn't

there?

A. We never have had any difficulty about that, that I am aware of.

Q. (By Mr. Richardson.) Haven't you requested the Wame-

sit Company to remove the sand?

A. I can't remember in regard to that, any further than I might have spoken to Mr. Tilton, and told him I thought it ought to be

removed, ought to be cleared out. I think I have.

Mr. Richardson. I put in chapter 2 of the Acts of 1833, incorporating the Bleachery Company, and chapter 52 of the Acts of 1847, increasing the capital stock of the company.

FORDICE COBURN, sworn.

Q. (By Mr. Richardson.) How long have you had charge of the Bleachery works as foreman?

A. About thirty-five years.

Q. This piece of land adjoins their great works, does it?

Q. What are the mills there, and what do you do?

- A. We make what we call bleached goods, and color and print them.
- Q. Do you remember, after this deed was made, the construction or the extension of the canal down to your works?

A. No, sir.

- Q. You don't remember that the canal was ever built?A. Yes, I remember the canal. You asked me about the deed.

Q. Did you have the care then?

A. Yes, sir.
Q. Was it finished then, or has it been finished since?

A. It was finished after they bought it.
Q. When did you put in your flume after that?

A. I think it was in 1863.

Q. What I meant was, was the canal finished down to that when the flume was finished?

A. Yes, sir; that was in '63, I think.

Q. When, if ever, did you put a wheel into the flume?

A. That I am not positive of. I think in 1865.

Q. How large power was the wheel?

A. I think 75 horse-power.

- Q. How much power was required to run all your machinery on that wheel?
- A. We have never run over what we call eight horse-power with it at any time.

Q. Now please state what the purpose was in having a wheel of that size when it was constructed?

- A. Well, it was to run our repair-shop, and drive a force-pump in case of fire.
 - Q. For the whole region?

A. Yes, sir.

Q. Have you ever had occasion to use it since that time to put out a fire?

A. We have.

Q. How many times?

A. I think twice.

Q. Is there land enough within this Bleachery enclosure, where you could put up other buildings for mill-power?

A. Yes, sir.

Q. For the whole 75 horse-power?

A. Yes, sir.

Q. How much of the time do you use it for your power?

A. I can't say that we never use it for any work except to run the repair-shops. We never use it when our mill is running by steam power. We use it in case of accident, or anything of that kind.

Q. For what other purposes do you use that water?

- A. Washing, bleaching, coloring, and all that is required for doing such work.
- Q. What sources for that supply have you, if you have any other than this?
 - A. We have the city water.

Q. What else?

A. We have the water of the brook, that we can pump.

Q. Is there any apparatus connected with this flume for the purpose of using that water for bleaching and dyeing?

A. Yes, sir. Q. How?

A. By pipes carried out of the flume.

Q. State what the arrangement is at the flume to convey water over the works, and what it is used for?

- A. It is used for bleaching, washing, the boilers, and anything that is required in the establishment for bleaching or coloring.

Q. When your works are running full, how much water do you use for those purposes a day?

A. I can't tell.

- Q. About how much? You have got some estimate, have you not?
- A. I have estimated about how much city water it would take. We could not get along with less than three thousand gallons a minute, with the work we are doing. When it is in full operation, it will require more.

Q. How much more?

A. Say another thousand gallons.

Q. Won't you describe the way the water is delivered from this flume, how you get it over your works, and the extent of the delivery?

A. The flume is carried into our yard, and there we take the water from a pipe at this flume and the different pipes connected.

Q. How many of them have you got that take the water?

A. I cannot tell that very easy.

Q. Well, capable of carrying how much?

A. I cannot tell that; I have no figures; but we have probably forty different places to deliver it.

Q. Could you get the whole amount of that water out of your pipes if it was there?

A. Yes, sir; we could get all we wanted.

Q. Now state what the arrangement is as to pumping up from the river.

A. We have pumps.

Q. What is the power to run those?A. I cannot tell that.

Q. What is the power; is it water or steam?

A. Oh, steam.

Q. What do you have to pay per thousand gallons for the water of the city which you take for this purpose?

A. Twenty cents.

Q. When that canal was constructed would the water in it all pass out through your flume, if you shut the gates at the river and the other gates along the canal?

A. It would all pass out above, as far as the Wamesit power. I can't say as to above that. I have seen the canal perfectly dry

there.

Q. How is the Wamesit power flume at the point where it comes into the canal? Is it on a level with it or below?

A. I can't say how it is now. A couple of years ago it was below.

Q. You have had some difficulty as well as Mr. Wood, as to the supply of water?

A. We have had no water at times, and at times we have had

plenty.

Q. When you started in the morning were you capable of taking water, generally?

A. Yes, sir. I don't recollect any times but what we had

water in the morning when we started.

Q. That has arisen out of the practical difficulties of dividing the water above, has it not?

A. I don't know how that is. Certainly we do not get it after a certain time?

Q. Do you know how much it costs to pump water up from the river?

A. I don't.

Q. What quantities do you pump up from the river, and do you pump from the river when you can get it from this canal?

A. No, sir.

Q. Is it cheaper and better to use this canal water than the water of River-meadow brook?

A. The Concord water is cheaper.

Q. (By Commissioner Russell.) How high do you pump it?

A. Sixteen or eighteen feet.

Q. (By Mr. Richardson.) How much higher is the water of the full canal than the water of the brook?

A. When the canal is full it is nearly twenty feet.

Cross-examination.

Q. (By Mr. Butler.) The Bleachery was established some time about 1833, was it not?

A. 1832 or 1833, I think.

Q. And they depended upon River-meadow brook for their supply of water down to 1862?

A. No.

Q. Where did they get it?

- A. They got it from Concord river. Q. Which way did they take it?
- A. The same way they get it now. Q. That was in 1862, wasn't it?
- A. No; I think they got it from there in 1844, '5 or '6. Q. What, through the canal?

A. No. There was a canal there; not this same canal, but there was a canal.

Q. Now, practically, is Concord river water fit for bleaching?
A. We have to use it. Yes, sir, it is, for certain parts of it.

It won't do very well for white goods, the last rinsing.

Q. Now, then, in 1864 or '65, this canal was bought, and the right to take so many feet of water. The object of that was to have a power which could be made instantly applicable, whenever your steam power was out of order, out of gear, or the boilers were not heated, so that you could be sure to have the fire-pump applied nights and Sundays?

A. Yes, sir.

Q. And it has been substantially used for that?

A. Yes, sir.

- Q. Nights and Sundays, there is always plenty of water now, is there not?
- A. I think there is, as a general thing. Sometimes there is no water Sundays, I have noticed.

Q. That is when they repair the canals?

A. Yes, sir.

Q. But suppose they open the gates?

A. Yes, sir, I should think there would always be water there.

Q. And sometimes, when your neighbors above draw too much,

do not have any water through the whole day?

A. I don't know whether the gates are shut down or not. But not through the whole day. No, there is no day when we are cut off entirely, - working days.

Q. You have it in the morning, but in the afternoon it gets

very low?

A. We have it from twelve until two o'clock, very often. Q. That is, when they shut down at noon, you get it?

A. Yes, sir.

Q. You have to use for bleaching purposes, three, four or five thousand gallons a minute?

A. Yes, sir.

Q. And to supply that from the city, you think would cost twenty cents a thousand gallons?

A. Yes, sir.

Q. Well, how much of the time isn't there water enough to supply at least three thousand gallons a minute in your flume?

A. Well, I can't say; I can only guess at it. Perhaps there

would be five or six weeks in a season.

Q. Five or six weeks in a year?

A. Yes, sir.

Q. That is, reckoning all the days together?

A. Yes, sir; I should not reckon Sundays. Reckoning week days.

Q. (By Commissioner Russell.) How much of your water are you obliged to use, not from the Concord? What proportion of

greater purity than the Concord water will give you?

A. I can't say as to that. We pump a good deal of spring water from other sources; from the Merrimack, or the Concord, for our "white goods," as we call bleached goods. That is, we pump it for the last rinsing. And since the city water was put in, we have used some of that, but I can't say how much. If we had Concord river water, we should not use but very little city water.

Q. Are your fire-pumps connected with any other power than

Concord river?

A. No, sir; we use steam-power. We have one fire-pump connected with the steam-engine.

Q. (By Commissioner Stevens.) This pump is not connected with the steam-engine?

A. No, sir; not that one.

Q. (By Commissioner Russell.) My question is, whether your force-pumps, to be used in case of fire, are connected with any other power than that which you get from Concord river?

A. Yes, sir; they are.

Q. (By Mr. Richardson.) Can you run them with anything else than the Concord river water?

A. Yes, sir, we can; some of them.

Q. (By Mr. Butler.) For instance,—let me put a question which I think will illustrate it. Suppose you had a fire, and your steam-engine was running, you would put on your steam force-pump?

A. Yes, sir.

- Q. If your steam-engine was not running, you would put on the water?
- A. If there was a fire, and we needed them, we should put on the water and steam both. But we are connected with the city water now, and we hope we shall not need either of them.

Q. Now, you are dependent upon the head of the city water?

A. Yes, sir.

[Adjourned to Thursday, at 9½ o'clock.]

THURSDAY, October 12th.

The commissioners met at 9.30. A. M.

JOSEPH P. FRIZELL, recalled.

Q. (By Mr. Richardson.) Will you give a statement of what is the cost, either with interest and depreciation or without it, of pumping water?

A. From the various results of different pumping-works, about a fair average would be about twelve cents per million gallons, raised one foot. That does not include interest and depreciation.

Q. And a corresponding increase the higher you go? Is that the measure when you multiply by the number of feet?

A. Any greater number of feet would be in the same ratio.

Q. That includes the expense of pumping — not the cost of machinery, or depreciation?

A. It would not include interest or depreciation.

Cross-examination.

- Q. (By Mr. Butler.) But after you got your plant, to raise it one foot, the next foot I take it would be substantially cheaper. After you had got your fire up, and your steam up, to raise it one foot, the next foot would be raised a little easier or cheaper, would it not?
- A. Not one foot. It is only a question of raising it one foot.
- Q. Without stopping to spend time upon that, will you tell me how many cubic feet per second, or parts of a cubic foot, five thousand gallons a minute would be?
- A. (After making a calculation.) I make it out about eleven cubic feet per second. A million gallons a day is equal to 1.55 cubic feet per second.

Q. How many gallons in a cubic foot?

A. Seven and a half.

Q. Now Mr. Frizell, I want to ask you another question: what is the average yield of the Merrimack water-shed? Take your unit of measure whatever you please, either an acre or a square mile?

A. I am not able to say.

Q. From so much rain how much do you get into the river?

A. I am not able to say how much.

Q. I suppose it is the same with the Sudbury?

A. I have no means of knowing what amount of rainfall is

collectable on the Sudbury.

Q. What I want to call your attention to is this: Brother Shattuck says the minimum, on the Concord river is one-third of a foot per square mile, and the minimum on the Merrimack is six-tenths of a foot per square mile. Do you know of any cause that should

make that difference in the supply of the water? Do you know of anything in the two rivers that would make that difference, — one-third in one case for the yield, and six-tenths in the other?

A. Nothing but the extent of the drainage ground. Q. Well, that is six-tenths of a foot per square mile?

A. Per second, sir, as I understand it.

Q. Which square mile would be the largest, on the Merrimack or on the Concord?

- A. I suppose the square mile is the same in the one case as in the other. The drainage ground is greater on the Merrimack than on the Concord.
- Q. Well, then, you would agree substantially would you, to this: That, taking the great extent of drainage area, we should find that difference?

A. Well, we evidently do find it.

Q. That is the statement; I only wanted it in evidence. Now, did you make that calculation that I asked you yesterday to make: suppose the water is drawn down every night to the top of the permanent stone dam, what would be the flow of water to be depended upon at the Wamesit dam for the use of the canal?

A. As compared with the condition of things when the water is allowed to stand at the top of the flash-boards all the time, you

mean?

Q. Or running over, as the case would be?

A. There are no exact data to determine that question. You can get an approximate idea of the effect of such an arrangement, to do that, - if you know the extent of the pond above the dam. (You can make it out from the map. The pond is about three miles long; you have no means of knowing how wide it is. Assume it to be 300 feet wide. According to the map it is a little over three miles from the Wamesit dams to the North Billerica dam according to the State map.) Then, taking those figures, that would illustrate what I mean: supposing you had a pond three miles long and 300 feet wide, and you can vary the water eight inches on that pond, that would be equivalent to a storage capacity of about 16,000 feet by 200. It would be two hundred times 16,000 cubic feet. It would be 3,200,000 cubic feet to be distributed over a period of about 40,000 seconds. That would increase your quantity of water, as compared with the other supposition, by about 80 cubic feet per second.

Q. And it would diminish the power in the canal, if it was drawn down that way, about 80 cubic feet per second. If it was drawn down even with the top of the dam, and left there ready to begin in the morning, instead of being drawn down to the top of the flash-boards, it would diminish the power about 80 cubic feet

per second?

A. I don't know that it would diminish the power.

Q. Then you and I don't understand each other. If the dam gives so much with the water at the top of flash-boards, utilizing the pond, and then you draw the pond down regularly to the height of the permanent stone dam to start with?

A. Do you mean to start in the morning at the height of the permanent stone dam?

Q. Yes, sir.

A. I don't understand you proposition. I supposed you wanted

to avail yourself of the storage capacity of the pond.

Q. No, sir. I assume that that belongs to somebody else, and that he takes it and carries it off in the night-time. Now we start in the morning with the water at the top of the permanent stone dam—what would be the amount of water that would be diminished in the canal, from what you say now it would give with the flash-boards on. Of course it would be 80 feet less, would it not?

A. I don't know that I understand your last proposition.

Q. I will state it again. I suppose that you have given what is the capacity of the river, keeping the dam up eight inches higher than the stone dam is, by means of flash-boards?

A. What I have endeavored to give is, the power that would be gained by the use of the storage capacity of the pond above the

dam.

Q. I understand that is what you have just given, — what would

be gained; but gained from what?

- A. Gained from what would be available by keeping the surface of the water constantly at the top of the flash-boards, or any constant height.
 - Q. It would be gained by that, but gained from what point?

 A. Gained above the power that would be available by keeping

the surface of the water at any constant height.

Q. Up to the stone dam?A. Anywhere you please.

Q. It must be at the stone dam, because you only take a storage capacity of eight inches above the stone dam. Now, when you gave us the amount of water that could be made available through the canal, did you give it to us as an amount, including that which was stored with the flash-boards on, or only including that which was stored by the stone dam?

A. When I gave the quantity of water that could be depended upon as the result of my measurements, I gave it on the supposition that water was being drawn during the night, as it is at present; I gave it on the supposition that water was to be drawn

during the night, as it was during our measurements.

Q. How was it being drawn during the night during your measurements? And do you know how much was measured? Whether it was going over the dam or through the wheels, you didn't know, I suppose?

A. I knew it was not going over the dam.

Q. Now, have you any idea, with the dam fully up to the top of the flash-boards, what would be the capacity of that canal, i. e., how much water would go through it?

A. I believe I have stated how much water was observed to go

through it under that condition.

- Q. Now if the storage eapacity of the flash-boards was eighty cubic feet, would not the amount be eighty cubic feet less, if kept down to the top of the dam?
 - A. Not necessarily. Q. Presumably so?

A. What amount? The amount that would go through the canal?

Q. Yes, sir.

A. Less water would be drawn through the canal.

Q. That is exactly what I want to get at. I understand that

there would be less as well as anybody.

A. I think I have given you the quantity passing through the

A. I think I have given you the quantity passing through the canal at different heights of water, as observed near Wainesit dam.

Q. That is not the point, Mr. Frizell. You have come here to instruct us by your testimony upon the capacity of that river to supply the water-takers on the canal.

A. As far as I have been able to ascertain.
Q. To the best of your knowledge and belief.

A. I should have to study the subject about three years to

answer every question that could be asked on the subject.

Q. All that may be so; I don't want to say exactly what I think on that matter. But listen to my question, and when we get through, answer it if you can; or, if you cannot, say so. You come here to tell us, according to your best knowledge and belief, how much water would be supplied through that canal to the water-takers on the case, by Concord river. Was that estimate made upon the use of the flash-boards as a storage-power, or without them? That is the whole question.

A. That estimate did not include the gain that could be made

by storing water at night.

Q. It did not include the gain that could be made by storing water at night, you say. Then there would be just as much delivered without the flash-boards, according to your estimate, which is without the amount that could be delivered with the flash-boards on the dam?

A. Not exactly that.

Q. How inexactly that?

A. My estimate is of the amount of water that could be depended upon at the Wamesit dam.

Q. With or without flash-boards?

- A. In the condition of things that existed during their measurement.
- Q. Now, was the water ever up to the top of the flash-boards for any considerable period during your measurement?

A. It was.

Q. How much of the time?

A. I cannot tell without examining my figures. Q. Was it one-quarter, one-half, or one-third?

A. It was not one-quarter of the time.

Q. Was it one-fifth?

A. Probably not more than that.

- Q. One-fifth of the time, then. If it had been kept up to the top of the flash-boards the whole time, I suppose there would have been a very appreciably greater amount of water more, would there not?
 - A. I cannot see how there could have been any more water.

- Q. I want to get at that. You say you don't see how there could be any more water used by the use of the flash-boards, do you?
 - A. You asked me if there could be any more water.

Q. I say any more water "to be used"?

- A. There might have been more water to be used during the day, and less to be used during the night.
 - Q. Well, that is the time when it is used generally, is it not?
 A. I understand that it is used during the night a good deal.
- Q. Mr. Frizell, the deeds put in here do not allow the canal takers to use it more than eleven hours in the twenty-four, for six days in the week. Do you think the flash-boards would make any difference in the amount of water they would get to use during that time, provided they used it during the day, and not at all during the night?

A. I think it would.

- Q. How much more? That is the very point I want to get. I mean with eight-inch flash-boards.
- A. I have endeavored to tell you how much upon a certain supposition.
 - Q. Yes, sir, upon the supposition that the pond was so large.

A. Now, if the pond was larger, you can modify that result accordingly.

Q. Eighty feet upon your measurement; and, if the pond turns out to be larger, it would be increased according to the increase of the size of the pond?

A. Yes, sir.

Q. Now, did you go over those figures that I handed you, sir?
A. I believe so. Here are several papers that you handed me.

Q. I will take the table showing approximately the flow of the Sudbury river, with a water-shed of 75½ square miles, in cubic felt per second for twenty-four hours per day, the average being taken by months. The paper is marked "J. P. F. 1."

A. I did not go over all these calculations. I went over one of them to examine the principle on which the calculation proceeds.

Q. Did you find that correct?

A. That is correct. Yes, sir.

Q. Then assume that the rest are correct. Now, will you state

the principle on which that is made up?

A. This appears to be a statement of the flow of the Sudbury river, taking an average of one month in each year for a series of nine years. There are twelve results. The first result embraces the months of least flow, and the second is the second in order of scarcity, and so, as I understand it, there is another column embracing a period of thirteen years upon the same.

Q. Now it is, taking the average flow, found how?

A. This is found by the result of observations at Lake Cochituate, observations by which the collectable percentage of rainfall is ascertained for different months of the year.

Q. How ascertained?A. I cannot say how.

Q. Whether by taking a percentage or an absolute flow of water?

A. I understand that the flow of water is so as to be measured.

Q. It is the rainfall's measure?

A. The total quantity of water falling in the drainage district is calculated, and the ratio between the one and the other ascertained.

Q. Let me see if I understand. Ascertaining the collectable water on the Cochituate water-shed by measuring the flow through the conduit, and applying that amount as the ratio of collectable water on the Sudbury river water-shed, of 751 square miles, it would give in the months of the least flow, those results for a series of years?

A. If I understand it, here is the average flow of each month for the whole nine years, and for the whole thirteen years. That is one result. The next is the average flow of the months stand-

ing second in the order of scarcity.

Mr. BUTLER. And the next lowest after that, and then the next lowest after that, and so on. That is to say, if I understand the tables: in the lowest month the average flow of the Sudbury would be 29.2 for nine years, and in thirteen years it would be 28.7 the average. Then take the next dryest month in each of those nine years and the average flow of the Sudbury would be found to be 43.5 for nine years, or 44.5 for thirteen years. Take the next dryest month and the average flow would be 53.2 for nine years, or 52.7 for thirteen years. Taking the fourth dryest month it would be 62.9 for nine years, or 63.4 for thirteen years. Taking the fifth dryest month it would be 74.1 for nine years, and in thirteen years it would be 76.8 - average. In the sixth dryest month, in the order from the least, it would be 85 in nine years, and 86 in thirteen years. For the seventh dryest month it would be 95 in nine years, and 99 in thirteen years. For the eighth dryest month it would 123 in nine years, and 124 in thirteen years. For the ninth dryest month it would be 144 in nine years, and 143.3 in thirteen years. For the tenth dryest month it would be 184 for nine years (leaving out the fraction), and 176 in thirteen years. For the eleventh dryest month it would be 221.3 for nine years, and 210 in thirteen years; and for the twelfth or wettest month it would be 302 in nine years, on the average, and 290 in thirteen years. I think you will now understand that table, Mr. Francis.

We do not take the dryest month in each year, but the dryest. month for nine years, and ascertain what that would be, and then the second dryest month in nine years, and ascertain what that would be, and then the third, and so on.

Mr. Shattuck. You had better put the man on who made the tables.

Commissioner Russell. The paper does not show upon what basis it is made.

The WITNESS. I took the tables published in the Cochituate water reports.

Commissioner Russell. You took the dryest month of each

year, and not the same month?

Mr. BUTLER. It is the dryest month in each year for the first result, and the second dryest month in each year for the second. The proof is in the tables which are put in, and in the computation. It is what was put in of the flow of Lake Cochituate, and measured by the water conduit.

Mr. Storey. I don't understand that there is any evidence of

that.

Commissioner Russell. I don't understand that those tables

have been proved by any competent evidence.

Mr. Child. We propose to have the tables here. When the tables are presented, and the manner in which this computation is made up is explained, we can tell. You have put in water-gauges and measures of the rainfall and all that.

Mr. Shattuck. That is a matter of common scientific knowl-

edge.

Mr. Child. This is just as much a matter of common scientific knowledge as the "rainfall on Lake Cochituate," which is on the

next page.

Commissioner Russell. I am not aware of the introduction of any evidence in any case thus far showing the flow of water from Lake Cochituate. It may be in, but I don't recollect it.

Mr. Butler. Here is a table of the flow of water from Lake

Cochitnate:

Commissioner Russell. That table has never been put in to

my knowledge.

Mr. BUTLER. (Handing volume to Commissioner Russell.) Now we offer it as part of a document that has been put in by the other side.

Mr. Child. Mr. Shattuck had that very book yesterday.

Mr. Butler. I have not objected to this book being put in evidence, and cannot do so, because this is a report of the authorized agents of the city in regard to what they have done in regard to water. That they have put in, on the opposite side to this almost — the rain-gauge — and they use it continually without objection. Having put in a portion of this report, I insist that the whole should go in; and it is as unjust as a thing could be to have it otherwise. They could not prove the rain-gauges without it. They could not prove, for instance, the locks and canal rain-gauge. The man is dead that kept it for thirty years. Here is an official report, of which they have used a part. Then, by every principle of practice, it is put in as a declaration of our authorized agent, and could not be objected to if you wish to object, and would not be if you could. Now I claim that the rest of the official report, for the corresponding months and corresponding days, shall go in in every case and every class of cases. The rain-gauge is in this report; and the Cochituate rain-gauge has been used and commented upon, and I could not object to it, and I did not object to it, because I could not; because this is a report of the Cochituate Water Works, and, under every principle of law that I know of, we are bound by it, whatever there may be in it; and they have used it. Then I have a right to use everything else said at the same time, and everything else said at the same time was what was said within the covers of the same book.

Mr. Storey. Mr. Mills testified that certain rain-gauges showed

so and so; but he did not put in that document.

Mr. BUTLER. Then if that is to be done, I want all that has been put in about rain-gauges stricken out. The testimony of Mr. Mills was put in, he referring to this; and the Cochituate watergauge as shown here is referred to by every witness. This manœuvre is a little piece of sharpness that I have not expected, and have not seen until it has got upon the Wamesit dam.

Mr. Shattuck. I supposed that these water-gauge measurements did not go in strictly as evidence. It is like ascertaining how much the tide rises and falls, which is practical data, and, in scientific books, might be referred to in order to verify a fact within common knowledge as to what the rainfall is. Whether that rule would be applied to this it is not necessary now to consider; but I suppose that has been the theory on which these raingauges have been put in. At any rate, nobody has objected to them, and it went in on that ground. Now it is proposed to show what the exact amount of water flowing from one of the reservoirs is; and when they desire to prove that, it seems to me that it is proper for them to prove it by additional evidence. It looks very much as though these cases would all go through without anybody's having the benefit of any special knowledge which may exist upon

the subject.

Mr. Storey. This book purports to be "Reports of Cochituate Water Boards to the City of Boston." Those boards are authorized agents of the city. No portion of their report has been put in. They put in, in their report, the report made by a gentleman coming from Chicago. They print as an appendix the report of J. P. Davis, City Engineer, made to them. It is his preliminary report and his final report. They merely print them as reports made to them, in order that the City Council may have the benefit of them. Those gentlemen do not seem to stand upon any better foundation than Mr. Fitzgerald, who is subordinate to the first named. that, on Mr. Butler's ground alone, it does not appear that this report is entitled to be admitted. But going beyond that, it is perfectly competent to prove, by declarations of a party, facts against himself; but that does not make it competent for him to put in his own declaration in his own favor. If the City of Boston were an individual, and has made as an individual every statement herein contained, it would be competent for us to put in the statements as evidence to support our case. it would not be competent for the city to put in statements made by itself as evidence in its own favor. The only limitation, as I understand, to that doctrine, is this: that where we undertake to put in declarations which form part of a conversation, we must put in the whole conversation; where we put in one letter which is part of a correspondence, and the rest is necessary to explain it, the rest of the correspondence must be admitted. This does not come under either of those exceptions. If it were put in, as a declaration by the city, it is competent; but that does not make competent every other declaration which the city chooses to make on every other point connected with this

matter. We put in the rain-guage. That does not make it competent for them to put in a fact entirely independent of the rain-guage.

Mr. Child. This is the result of the rain-gauge.

Mr. Butler. I desire to see how this case stands, and then leave the matter to the commissioners. The city is carrying on a great public work, for public use, under power of the act of the legislature. The legislature appointed for the city, and the city for themselves appointed an agency, to wit, the Cochituate Water Board, to do that work. That agent reported to the city his acts and doings, and the results of his acts and doings. He reported how much water had been supplied to the city, and, as a part of that report, how much had been collected and how much had been supplied, and, as a part of that report, he states the rainfall, and then says: "We have saved so much of that"—the rainfall to be ascertained by the rain-gauge. The agent puts it in the form of a table, because that is the most convenient form of stating it—one table on one page and the other on the other, and the two showing correlatively.

Now, these gentlemen on the other side put in a portion of that report. That has been done, or else I have been asleep for the last three weeks, pretty much all of the time. That has been done, and referred to by every witness; referred to by Mr. Frizell in these cases, stating how it appeared from that rain-gauge, that there was a larger amount in the Sudbury than at Lowell (that being the nearest proved), without objection on my part, because I could not

object. It is the declaration of the agent of my client.

Now, all the rule, if I understand the rule of law, is this: Whenever the declaration, or any portion of the declaration of a party, or of his agent, is put in by his opponent, everything that he said at the same time, in pari materium, which tends to illustrate, explain or control that matter, is to be put in. You cannot pick out what you want out of a man's declaration and put that in, and then say that the rest of what he said, which was upon the same subjectmatter, shall not go in. Very well; that, I think, is the rule of law.

Mr. Storey. Does that statement of the amount of water of

Lake Cochituate tend to control the rain-gauge?

Mr. Butler. It is a measure of the rain-gauge. It corrects the inequalities of the rain-gauge. It shows that the rain-gauge is kept inadequately and does not show the flow of water. It does qualify it. They put in the rain-gauge to show that, up there by the Sudbury river, there is an immense fall of water, and put in our declaration of the rain-gauge as evidence of that immense fall of water. At the same time that we stated that the rain-gauge showed that, we, in the same report, on the next leaf, stated that that was corrected by the actually measured flow, and, therefore, that it was a mistake to say that there was so much. Very well; that is the condition of things exactly; and I supposed, with the liberality which I have attempted to exercise all the while, dealing with this matter, not with catches and quirks—

Mr. Shattuck. [Interrupting.] You first objected to the

report.

Mr. Butler. Pardon me, now. With the liberality with which I have gone on (and I call to witness the commissioners as to whether I have not attempted to be as liberal as possible), I have hardly made an objection. Now, Mr. Shattuck says that I objected to the report. Pardon me; I did not. I objected to a history made by a gentleman who is not an agent; and if Mr. Shattuck had been well up in his case as published, he would have taken another report of another year, and found exactly what he undertook to give, and got it in, and I should not have objected; but he would also have found an explanation of it in that report. I only objected to the history going in, and to the taking out of one statement from that history.

Well, now, then, these gentlemen, having got the advantage of a portion of our statement, objected to our correcting that statement by what we said at the same time. It rather smacks of the Old Bailey; but I shall know how to deal with them if ever I try this case again. They will get it by the hardest in the future. We can get on. I think I understand the technical rules of law reasonably as well as any one of the gentlemen on the other side. I do not attempt to multiply myself by nine. But taking any one of them, I would say that thirty-six years of practice has given me some little experience; and I have been quite as often in courts as

any one of them.

Now they object to this being admitted; we are seeking after the truth. Here is a great public work. You cannot expect that we have wrongly measured that water, which is a vital matter to us, in order to affect Snyder's mill with its accumulation of mortgages. Nobody supposes that for a moment. But it is the results of a great public work, made in the course of public employment. I distinguish it, then, in toto, from putting in the effect of the fall of the tide, or anything of that sort. Those are matters that we know. The motions of the planets are regulated by unalterable laws, and therefore the almanac always proves itself; and the time when the tide rose and fell on a certain day can be proved by the almanac. But how it rose on a given day, or at a given place, must be proved by somebody's measurement, if it becomes important. How much rain fell in a given place on a given day must be proved by evidence; so I think my brother Shattuck's idea that we went in here on the ground that this was a portion of the action of nature is entirely illusory. We agree that it is a portion of the action of nature; but the thing that we want to get in is, "How much did nature act at that time? How much rain dropped down on that day?" There might not any have dropped down at all, or there might have dropped down twenty-six inches, which, I believe, is the largest known amount for any one day. It is not a matter of common learning; it is very uncommon learning. The question is for you. I thought you would like to know exactly this fact before you got through with the cases, and I have now attempted to prove it. If you don't want to know it you will say so, and there is the end of it. The cause of right here, I think, will be promoted by knowing it.

I have been waiting, before I produced any testimony, to see exactly what theory they would get up. I foresaw the difficulty that when Mr. Talbot's case was to be tried they would have to prove a great deal of water running over his dam; and when the Wamesit case was tried they would have to prove that there was a very little; and I did not dare to put in any evidence until I got in those two classes of cases; and I am waiting now, having got the theory and having got down to the last dam. I propose to give some little measurements, and prick some bubbles that have been testified to here, and I shall let the wind out of them, I think.

Commissioner Russell. The commissioners all agree that it is important that they should have the information which these tables, if correctly kept and properly proved, would give them. But we are of opinion that the mode of proof should be the ordinary mode of proof by calling witnesses to establish measurements, and not by the introduction of a report of one agent of the City of Boston to a department of the City Government of Boston. We should not, of course, hold that the city was bound to prove the accuracy of each measurement and of each observation. But I suppose that the proof that the city has measured the Cochituate water by some process of measurement, and that that is a proper and scientific mode of measurement, and that the record has been kept of that measurement, and that the results are as shown by those tables, would be admissible proof.

Mr. Butler. If we can give it to you we will. Do you require

us, gentlemen, to do that now?

Commissioner Russell. If the report had been introduced, or if the parts of the report connected with these observations and measurements had been introduced as part of the direct testimony on the part of the petitioners, I should be inclined to hold that the other parts of the report bearing upon the same matter were also to be admitted as part of the city's case. But I don't understand that the petitioners have introduced any part of the report which the city undertakes to offer for another purpose. They have proved by scientific witnesses the amount of rainfall upon various areas of water drainage. Those experts have referred to rain-guages kept in various localities, and without objection they have treated those rain-gauge records as correct, and as facts open for their knowledge. Whether they would have been so held or not if objection had been made, is, of course, another matter.

Mr. Butler. This very book, the Report of the Cochituate Water Board for 1875 and '76, was put in, or part of it; and the amount of water taken from Sudbury river is stated here. This contains substantially the same table. Otherwise you will find

you have not got that testimony in anywhere.

Commissioner Russell. We do not hold that you are bound to call the parties who took these measurements and recorded these observations, but only to show that the city has adopted a method of measurement there which can be shown to be a proper method of measurement, and that they have kept a record. I have no doubt that the proof is within the power of the city.

Mr. Storer. "I have not in the opening, General Butler," (says Mr. Hodges, in his argument), "said anything about the

taking of the water.

"Mr. Butler. In this case, it will be agreed that the Water Commissioners took the water from June, 1872, until September, 1872.

"Mr. Hodges. For seventy-five days. . .

"Commissioner Russell. Did the taking of the water continue

after the filing of the petition?

"Mr. Butler. Yes, sir. I will take it exactly from City Document No. 103, —the report of the Cochituate Water Board for the year ending April 30th, 1876."

Then follows an extract from page 16 of that report.

Commissioner Russell. We do not understand that the book was put in, as a report, by the city.

Mr. Butler. We shall get at it somehow, I guess; it is not a

matter of a great deal of consequence.

[Mr. Storey produces copy of deed which was omitted when the other deed was put in.]

DEED OF ALFRED H. CHASE TO HOCUM HOSFORD.

Know all men by these Presents, That I, Alfred H. Chase, of Lowell, in the County of Middlesex and Commonwealth of Massachusetts, in consideration of thirteen thousand dollars, to me paid by Hocum Hosford, of said Lowell, the receipt whereof is hereby acknowledged, do hereby give, grant, bargain, sell and convey unto the said Hosford, his heirs and assigns, one undivided half of a certain parcel of land, situate in said Lowell, on Concord river, and thus described, viz.: beginning at the westerly corner of the premises at a stone marked on the easterly face of the easterly bank-wall of Whipple's canal, thence S. 301 degrees, E. thirty-two and 40-100 feet; thence at an angle of 186 degrees and twenty-five minutes, still more southerly twenty feet; thence still southerly at an angle of 191 deg. 9 min., ten feet; thence still southerly at an angle of 181 deg., 35 min., ten feet; thence still southerly at an angle of 172 deg. 40 min., ten feet; thence still southerly at an angle of 170 deg. 10 min., ten feet; thence still southerly at an angle of 141 deg. 10 min., eleven and 5-100 feet; thence still more southerly than said last line at an angle of 217 deg. 40 min., nine and 1-10 feet; thence westerly at an angle of 270 deg., seven feet; thence still southerly at an angle of 89 deg. 44 min., ninety and 85-100 feet to a stake at said easterly face of said bank-wall; all said distances from the point begun at to said stake being on the easterly or outside face of said bank-wall; thence from said stake easterly at a right angle ninety-five feet to a marked stone bound at Concord river; thence northerly on the westerly bank of Concord river to an iron bolt in the ground in the river, at a point which will be met by extending northerly to the river in the same direction the line now runs as to course, the easterly boundary line of a lot of land conveyed by Oliver M. Whipple to Joshua Mather, by deed dated May 18, 1857; thence southerly fourteen feet to a stake at the northeasterly corner of said Mather lot; thence southerly by said Mather lot eighty-seven feet to a stake at the south-easterly corner of said Mather lot; thence westerly at an angle of 218 deg. 53 min., fourteen and 28-100 feet, to the point of beginning. Also one undivided half of all the rights, water-rights, privileges and easements to me conveyed by Oliver M. Whipple by deed dated the twentieth day of February, A. D. 1863, and recorded in Middlesex North District Registry of Deeds, Feb. 21, 1863, book 23, page 184, subject to the provisions, reservations and conditions in said deed contained, pertaining to said one undivided half. Also one undivided half of all the fixtures situate in or connected with the mill now standing on said above-described premises. Also one undivided half of a certain tract of land situate in said Lowell and thus bounded and described: beginning at Grove street at a point on the northerly side of said street, which is one hundred and 81-100 feet distant northeasterly from the intersection of the northerly line of said Grove street with the easterly line of Lawrence street, at which point a stone post has been or is to be erected, thence running N. 581 deg. W., in a line parallel with the northeasterly bounding line of said Lawrence street about two hundred and twelve and 75-100 feet, to a corner; thence still more northerly at an angle with the last named line of 145 deg. 2 min., one hundred and two and 5-100 feet to land now or formerly of Ephraim B. Patch; thence northeasterly at an angle with the last named line of 101 deg. 38 min., along said Patch land about one hundred and twenty and 32-100 feet; thence northwesterly along said Patch land to a stone bound at said Patch land; thence N. 75½ deg., E. along said Patch's land about eighteen and 25-100 feet to a stone bound; thence S. 65½ deg. E., by said Patch land about one hundred and fifty-six and 22-100 feet to a stone bound; thence S. 331 deg. E., along said Patch's land about seventy-three feet to a stone bound at said Grove street; thence southwesterly along said Grove street one hundred and ninety-five and 48-100 feet to the point of beginning. Being one undivided half of the premises to me conveyed by Ephraim B. Patch by two deeds, one dated September 14th, 1863, and recorded in Middlesex North District Registry of Deeds, September 22, 1863, book 35, page 552, and the other dated November 6, 1863, and recorded in said Registry. The premises to me conveyed by Oliver M. Whipple by the deed first hereinbefore referred to, dated February 20th, 1863, are *subject* to a mortgage to the Lowell Five Cent Savings Bank. To have and to hold the above-granted premises with all the privileges and appurtenances theretically below the same and thereto belonging to the said Hocum Hosford, his heirs and assigns, to his and their use and behoof forever. And I, the said Chase, for myself and my heirs, executors and administrators, do covenant with the said Hosford, his heirs and assigns, that I am lawfully seized in fee-simple of the afore-granted premises; that they are free from all incumbrances except said mortgage to said Lowell Five Cent Savings Bank, and the provisions, reservations and conditions above referred to; that I have good right to sell and convey the same to the said Hosford, his heirs and assigns, forever as aforesaid; and that I will, and my heirs, executors and administrators shall, warrant and defend the same to the said Hosford, his heirs and assigns, forever against the lawful claims and demands of all persons except as aforesaid. In witness whereof, I, Alfred H. Chase, together with Helen F. Chase, wife of said Alfred H. Chase, who hereby releases all claim to dower and homestead exemption in the granted premises, have hereunto set our hands and seals this first day of December, in the year of our Lord eighteen hundred and sixty-three. Alfred H. Chase (seal). Helen F. Chase (seal). Signed, sealed and delivered in presence of (erasures having first been made) George F. Richardson to A. H. C.,

Daniel S. Richardson to A. H. Chase, Harry B. Chase to H. F. C. Middlesex, ss., December 28th, 1863. Then personally appeared the above-named Alfred H. Chase, and acknowledged the above instrument to be his free act and deed. Before me, George F. Richardson, Justice of the Peace. (Twenty dollar U. S. revenue stamp cancelled.) Middlesex, ss., North District. Recorded Dec. 29, 1863. A. B.

Wright, Register.

A true copy of deed recorded with Middlesex North District Registry of Deeds in book 36, page 364. Attest:

J. P. THOMPSON,

Register.

JOSEPH TILTON, sworn.

Q. (By Mr. BUTLER.) What is your age, sir?

A. About fifty-nine.

Q. How long have you been in charge of the repairs of the dam, and of keeping the head of water through the gates at Wamesit dam, including the time when Mr. Whipple owned it, and every other owner since?

A. I should guess about twenty years or more.

Q. When you first came there you were acting under Mr. Whipple?

A. Yes, sir.

Q. How many mills did Mr. Whipple own at the time on these premises, - separate mills?

A. Seven, I think; small mills, some of them were.

Q. The power was taken from the canal, which is a part of the present canal, with the exception of the power for the saw-mill?

A. Yes, sir.
Q. Did Mr. Whipple have any steam-power?

A. No, sir; not to carry any of those mills that I speak of.

Q. They were powder-mills, were they not?

A. Yes, sir; but he had one dry-house that he run by steam. That was not connected with the water-power.

Q. Mr. Whipple made the present Wamesit canal, did he not?

A. Yes, sir.

Q. And then sold a portion of this land and the power to various people?

A. Yes, sir; he did.

Q. Do you know whether he went into any measurements and calculations at that time to ascertain how much water-power there was?

A. I don't recollect that he did.

Q. Now, sir, after the canal passed into the hands of the Wamesit Power Company, was it deepened, enlarged, and widened?

A. It was.

Q. How far down, — as far as the Wamesit mills go?

A. Yes, sir.

Q. Was the little canal of Mr. Wood and the Bleachery interfered with?

A. That was made larger.

Q. Who had charge of the water and the repairs of the dam, and seeing that the water was properly delivered down to the mill as far as he could, on the part of the Wamesit Power Company, and on behalf of Mr. Wood? Was it not yourself?

A. It was.

- Q. Have you kept any measurement of the height of the water on that dam?
 - A. I have kept it back about two years.

Q. You never kept it before?

A. No, sir.

- Q. Who has those books of measurement, do you know?
- A. I guess they are here in the room. I think Mr. McDaniels has them.
- Q. The flash-boards are kept on all the time permanently, are they not?

 \tilde{A} . Yes, sir. Q. And gravelled up to, so as to make really a part of the dam?

A. Yes, sir.

Q. And your measurements were over the flash-boards?

A. Yes, sir.

Q. Is this your book?

A. Those are my figures.

Q. When did this book commence, — April, 1874? A. Yes, sir.

Q. How many times a day did you take the water?

A. Once.

Q. Once a day to begin with. Have you taken it oftener since?

A. No, sir.

Q. What time in the day did you take it?

A. Betwixt the hours of eight and nine. I calculated to take it about half-past eight. Sometimes I didn't take it until nine in the morning.

Q. At the time of taking, how does the water compare with

what it is usually during the day? Is it higher or lower? A. It is lower than it is through the day after that, some.

Q. How do you account for that, Mr. Tilton? Whether or not

the water has got down from Mr. Talbot's in the morning?

A. Well, I think the water hasn't got down at that time. water draws down, and the more the demand is, the more the supply.

Q. The water draws down? A. Yes, sir.

Q. The road on the east side runs right beside the river up to Billerica mills, does it not?

A. It runs some little way from the river, but it runs right along

pretty nearly parallel.

- Q. Is it about as far up the river as by the road up to the Billerica dam, or farther?
 - A. I should rather think it was farther round the road.

Q. How much?

A. I can't tell; I never measured, and never heard anybody tell how far it is round the river in that way. I don't know.

Q. These figures are in inches, are they not?

A. Yes, sir.

- Mr. Shattuck. I would like to look at the book before you put
 - Mr. Butler. Certainly. If I do not explode the idea that the

water does not run over the flash-boards more than three months in the year, I am mistaken.

Q. (By Mr. Shattuck.) When was this book kept?

A. It was copied, from time to time, about once a month, from the other book.

Q. You mean to say that you began in 1874?
A. That was copied off of my book when it was taken.
Q. Who made the copy?
A. The clerk.

Q. You don't know anything about that book?

A. No, sir; I would carry in my book, and he would take it down from time to time.

Mr. Shattuck. If it is an accurate thing, I do not want to make any unreasonable objection.

Commissioner Russell. I understood the witness to state that

those were his figures.

WITNESS. Those are my amounts. I didn't mean to say they were my figures. I had nothing to do with that book.

Q. (By Mr. Shattuck.) Wasn't that all made up in a very

short time?

- A. No, sir. It was copied in from my book from time to time. I never handled that book. He [the clerk] used to take my figures off.
 - Q. (By Mr. Storey.) Have you got the original book?

A. No, sir. Q. Where is it?

A. In Lowell. I didn't know what I was going to do with the book.

Mr. Shattuck. We would like to see the original, but we will not delay the hearing. You may go on with this.

[Mr. Butler put in the following table: —]

Table of measurements of the depth of water running over the Wamesit dam at Lowell, taken between eight and nine o'clock each morning when any water ran over the dam.

1874.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
1				5½	12½	10	3½		1			1/2
2				Fast.	121/2	9	31/2					1
3				5½	s.	9	3					1
. 4				5	121/4	9	4th of July.					34
5				s.*	11½	8½	s.					1
6				43/4	10½	8	1					s
7				43/4	10½	s.	1					3
8		X		47/8	10	9	1					3,
9		(5½	9	10	1/2		1/2			1
10		0 8		6	s.	10	1/2	5	1/2			1
11				7	8	101/2	1/2	5	1/4	er.	1	3
12		((1	s.	9	10½	s.	5	1/4	No water ran over during October.		3/
13				9	9	10½	3	41/2		0 50		s
14	1	1		9½	8	s.	41/2	6		urin		34
15		1	,	91/2	8	9	5	6		er d		
16				91/2	7	8	51/2	s.		040		
17				9	s.	8	51/2	6		ran		
18				9	81/2	7	5	6		ater		
19	1			s.	9	6	s.	51/2		10 W		
20				81/2	9	6	3	5		12		
21				9	91/2	s.	4	4				
22				9½	10½	61/2	3	4				
23				10	10½	61/2	3	s.				
24				10	s.	6	4	3				
25				10	101/2	51/2	3	2			1/4	
26				s.	11	5	s.	2			1/4	
27				101/2	11	41/4	1	21/2			1/2	
28				11	11	s.		3			1	
29				12	121/2	31/2		21/2				
30				121/2	101/2	4		s.			1	
31					s.			2				

1875.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			9	111	7	2	3	s.	2	3/2	21/2	71
2			8	131	s.	2	2		1	1	3	7
3			8	151	6	1	2	1 4	1	s:	3	7
4			7	s.	6	2	s.	1	11/2	1/2	4	61/2
5			7	18½	6	1	Holi- day.	11	8.	1/2	4	8.
6			61/2	21	. 6	s.	1	1	1		31/2	61
7			s.	22	8	1		1	1/2	1	s.	61/2
8			6	Fast.	10	1	1/2	s.	1 4	4	31/2	5½
9			5	19	s.	1/2	$2\frac{1}{2}$	1		5	3	5
10			5	17	11	3	4	11/2	}	s.	3	5
11			4	s.	12	5	5	1		5	4	4
12	No water ran over during January.		4	16	12	6	4	1	s.	61/2	5	8.
13	Jan		3	15	12	s.	31/2	3/2	1	7	6	4
14	dub		s.	14	11	8	3	1/2	1 4	7	s.	3
15	du		4	14	10	8	21/2	s.		61/2	7	3
16	over		61/2	13	s.	71/2	2	1		6	71	3
17	an		91	13	10	8	1		11/2	s.	8	21
18	ter 1		91/2	s.	10	7	8.	1/2	2	6	8	2
19	Wa		13	13	9	7	1	2	S.	51/2	81/2	s.
20	No.		121	13	9	s.	1/2	3	2	51/2	81/2	2
21 .			s.	12	8	71/2	1/2	4	21/2	5	s.	2
22			1112	11	8	8		s.	21/2	41/2	8	21/2
23			101	10	s.	8		5	2	4	8	21/2
24		4	91	9	8	71/2		5	2	s.	7	2
25		6	81/2	s.	9	61/2	8.	5	11/2	31/2		Christ- mas.
26		71/2	61/2	8	8	6	3/2	41/2	s.	31/2	7	s.
27		9	61/2	8	7	s.		41/2	1	3	8	3
28			8.	8	6	5	1	4	1	3	8.	21/2
29			63	7	6	4	1	s.	1	3	8	3
30			71/2	7	8.	3	1/2	4	3	21/2	7	3
31	1		91/2		3			3				31

1876.

			1	1		 	1	1	1	<u> </u>		
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4	11/2	4	34	101	31/2		4				
2	s.	3	4	s.	10	3		6				
3	5	1	31/2	30	9	3		7	ĺ			
4	5	3	3	28	9	s.		81/2				
5	51/2	2	s.	26	8	21/2		81				
6	5	s.	31/2	22	8	3		s.				
7	4	3	$4\frac{1}{2}$	20	s.	31/2		8				
. 8	5	5	6	20	7	3		8				
9	s.	51/2		s.	7	3		7				
10	5	51/2	7	21	8	4		6				
11	41/2	6	7	21	8	s.		5				
12	4	6	s.	20	81/2	2		5				
13	4	s.	6	Fast.	81	2		s.				
14	31/2	7	6	19	s.	11/2		4				
15	31/2	8	5 <u>1</u>	19	8	11/2		4				
16	s.	8	5½	s.	8	1		3				
17	3	9	51/2	18	71/2	1		2				
18	3	10	6	18	71/2	s.		2				
19	31/2	10	8.	18	7	1		1				
20	31	8.	6	17	7	1/2		8.				
21	3	9	8	17	s.	1/2						
22	3	9	101	15	61/2	15	3	1				
23	s.	81	15	8.	6	8.		1				
24	2	8	15	15	6	15		1/2				
25	2	6	16	13	5 <u>1</u>	13						
26	$2\frac{1}{2}$	6	B	13	51/2	13		1/2				
27	$2\frac{1}{2}$	s.	28	121	5	121						
28	2	5	34	12	s.	12						
29	2	4	36	12	5	12						
30	s.		36		4	8.						
31	1		34		4		3					

Q. (By Mr. Butler.) When the water runs over the flashboards in the morning, when you measure, in ordinary days, how does it, as a rule, act during the day? Does it continue to run over during that day?

A. Well, sometimes it draws down so that it don't run over

at all.

Q. Suppose you find the water running over two inches in the

morning, does it draw down during the day?

A. Yes, sir; I have seen it draw down so that it didn't run over at all, when it run over two inches in the morning.

Q. It does sometimes draw down in that way?

A. Yes.

Q. Would you put that as the limit, or how high is it? If it ran over the flash-boards three inches in the morning, would it be likely to draw down during the day, or does it, in practice?

A. I never measured it only once a day. I should hardly think where it ran over three inches but what it would run over drizzling

all day.

Cross-examination.

Q. (By Mr. Richardson.) You say that you made these measurements between eight and nine o'clock in the morning?

A. Yes, sir.

Q. Is the water lower at that time than it is afterwards in the

A. I don't understand your question.

Q. Is the water lower at that time than it is afterwards during the day?

A. No, sir. Q. Didn't you say that it was?

A. No, sir; anybody would know it would draw down after that. If I said that, I didn't mean to say so, because anybody would know it was a mistake.

Q. Didn't you state that the water began to come about nine

o'clock from Billerica?

A. I guess I didn't make any mistake there. No, sir; I didn't

make any such assertion as that.

Q. You put it that you measured at half-past eight, and then the water continued to draw down during the day, until it was more or less increased when the Billerica dam water arrived.

A. Between half-past eight and nine I took the measures.

Q. Understand my question. You took it between half-past eight and nine, and from that time, during the rest of the day, while the mills were running, until you got reinforced by the Billerica dam water, it continued to fall, — is that so?

A. That is so.

Q. When you took these measurements in the morning, at halfpast eight, when did you again see the water during the day at the dam?

A. I didn't go up at all during the day,—not to the dam.

Q. Have you during that period any other measurements of the water during the day?

A. The way we use to tell about the water dropping —

Q. Answer my question. Have you during that period any other measurements of the water, at any other time of the day, or not?

A. No, sir; that is all.

Q. While you were taking it at any of those times when you took those measurements, did you see that the water at Wamesit dam was reinforced by water which came down from the Billerica dam?

A. I think I have just said I didn't take any measures only

just once a day at the dam; that is, betwixt 8 and 9.

Q. I know; but when you took it, had the Billerica dam water got down so as to help make up the water you were taking? You say you took it at that hour, and when the Billerica water came down it rose. Had the Billerica water got down when you took your measurements?

A. I think I have stated here that I didn't think that the Billerica water got down much before 11 or 12 o'clock to do us any good at the mills. I so stated, not this time, but previous to this,

and I have not altered my mind on that all.

Q. In your examination you said that that water didn't get down till about noon?

A. Eleven or twelve o'clock, I think, I said. Q. Until about noon, or about 12 o'clock?

A. Yes, sir.

Q. Then the flow of water, as you know it in the canal, would continue to draw down after these measurements until about noon?

A. Yes, sir; it has always drawn down until about noon.

Q. Then have you any means of telling how much, when the Billerica reinforcement water got there, it would rise?

A. I never took any measures only once a day.

Q. Can you give any approximation of the rise that that water would make at the dam?

- A. I never took only just one measure a day, and that was betwixt 8 and 9 o'clock in the morning, only just what I have tested it down at our mills.
- Q. You have no means of judging of the condition of the water at the dam at any other time of the day. You only know that it would begin to draw down as soon as you used it?

A. We have a flow of water down the canal down to the

mills.

- Q. Will you tell us how the water stood at the dam on the morning of the 6th day of September last, the day the commissioners were there?
- A. I don't see any figures here at all on the 6th day of September.
 - Q. Did you go there that morning?

A. I don't see any amount there at all. Q. Did you go there that morning?

A. I don't think I did. I don't think I made any figures.

Q. Didn't you say that the measurements were taken every day?

A. When the water would run over the dam.

Q. When it was below the dam you took no measurements on

any day for the two years?

- A. No, sir. When it didn't run over the flash-boards, I didn't take any measures at all. I took the measures when it ran over the flash-boards.
- Q. What was your reason for taking measurements then, and not taking any other?

A. Those were my orders—to take it when it ran over the flash-

boards, that is all.

Q. You have the charge of the canal and dam, and have had for several years?

A. Under my superiors.

Q. You are every day over it, are you not?A. Yes, sir; more or less.

Q. Were you there when the commissioners were there to view the canal?

A. I was not with them.

- Q. At the hours they were there, from 10 to 1, was any water running in Wood's canal and the Bleachery canal?
 - A. I can't tell. I don't know what day they were there. Q. Has any sand drifted into the canal at Wood's flume?

A. There may be some.
Q. Haven't you been applied to several times to take it out?

A. No, sir; I never have been asked to take it out. Q. Hasn't Mr. Wood applied to you to take it out?

A. I have never been applied to to take it out, to my knowledge.

Q. Have you had any talk with Mr. Wood about that sand?

A. I can't say whether he has ever mentioned about the sand or not. I can't recollect anything about it.

Q. Haven't you seen the water there so that you could walk through Wood's canal and the Bleachery canal dry-shod?

A. Yes, sir. I have seen it when there was no water at all

running there.

Q. A good many times?

A. I can't tell how many times.

Q. A good many times?

A. How many times do you call "a good many"?

Q. I should call a hundred a good many. Have you seen it a hundred times?

A. I don't know. I never kept any account of it.

Q. You know what I mean. I want you to give us some general idea. I don't want to catch you. Within the period of two years, can't you give us some idea how often you have seen the water so that you could walk dry-shod below the Wamesit dam down to Wood's canal and the Bleachery?

A. I can't tell, because I have never kept any record of it.

Q. Can't you tell anything you have not kept a record of, sir? Is your mind so blank as that?

A. I am not supposed to guess, as I know of.

Q. Are you not willing to give us fair testimony?

A. I never have kept any account of it.

Q. I don't want it as certain. I want it as you would testify to other things. I want to know from you as the man who has had charge of that canal whether you cannot give us some idea, more or less accurate, of how much of the time you could go across that portion of the canal dry-shod in the twelve working hours of the day. I don't want to detain you long, but give us some idea. A good many times, wouldn't it be?

A. I can't tell, sir. I can't tell you how many times, but I have seen it so I could go across without wetting my feet, if I had on

tight shoes.

Q. When the mills are running, and the Wamesit wheels are running, is there not generally a loss of water in that canal? Isn't it drawn down very low?

A. Oh, yes, sir. I have seen it so that there was not supply

enough for the wheels.

Q. (By Mr. Butler.) Do you mean to say generally, through the whole year, or through the dry season?

A. The dry season.

Q. (By Mr. Shattuck.) What time in the day do you consider the water the lowest and highest?

A. It is highest in the morning.

Q. About what time in the morning?

A. Well, it is highest when we first start, about seven o'clock.

Q. When is it the lowest?

- A. Probably along in the afternoon, about three or four o'clock.
- Q. If it was only running over the flash-boards two or three inches at half-past eight, would you expect it sometime during the day not to run over?

A. Yes, sir. If it didn't run over more than two inches, I

shouldn't expect that it would not run over at all.

Q. If it didn't run over more than three or four inches in the morning, wouldn't you expect it not to run over at all sometime during the day?

A. If it ran over three or four inches, I should expect it would

drizzle over all day, until towards night.

Q. If it didn't run over more than four inches at half-past eight in the morning, there would be sometime during the day when it

wouldn't run over at all, would there not?

- A. I should think, if it ran over three or four inches in the morning that we could start, and along in the afternoon, or about noon, the Billerica water would get down, and help it, so that it would drizzle a little mite over the flash-boards.
- Q. Hardly run over, would it? You would not call it running over, would you?

A. No, sir.

Q. At three or four o'clock, don't you think it would be likely to stop running over wholly?

A. If it ran over three or four inches in the morning, I should

think it would run over all day a very little.

Q. Now, by your statement here, in the month of July, 1874, it appears that it was running over $3\frac{1}{2}$ inches, $3\frac{1}{2}$, 3, 1, 1, $\frac{1}{2}$, $\frac{1}{2}$, 3, 4, 5, 5, 3, 4, 3, 4, 3, 1. Wouldn't you say that all those days when it didn't run over three inches at the time you measured it, it probably didn't run over all day?

A. If it didn't run over three inches in the morning, it didn't

run over all day.

Q. In September, there were five days when it ran over one inch only; another day a half inch, another a half inch, another one-quarter, another one-quarter. Of course, it did not run over all day on those days?

A. No, sir.

Q. Why do you take your measurements at half-past eight.

A. I never wanted to take them until the mills had got fairly going, and the water began to draw down. Of course the water would draw down, and I used to make it my business to take the measurement as nearly as I could as soon as the mills got fairly running.

Q. Mr. Wood runs down to eleven o'clock generally, and then

stops for want of water, don't he?

A. That is frequently the case.

Q. Mr. Wood was generally running at the time you measured.

A. Yes, sir. They were all using all they could get.

Q. Who requested you to make the measurements?A. I made them by the order of our superintendent in the Wamesit Power Company.

Q. For what purpose did you make them?

A. I can't tell you. My orders were to do it, and I didn't ask any questions.

Q. Was that time fixed by him?

A. He told me to commence taking the water, and I did. I never asked any questions, and he never told me what it was

Q. Did he tell you to take the measurements at half-past eight?

A. No, sir; he simply told me to take the water, and I established that rule, I think; I don't know.

Q. How did you measure the water?

A. I took a straight-edge. There is what is called a bench cut in the ledge just as high as the cap of the dam — a square bench cut right in. I took a straight-edge and measured it on the dam, and got a certain land-mark, and then I took my measures.

Q. (By Mr. Butler.) Afterwards there was a gauge set up,

wasn't there?

A. There was a gauge set up by somebody. I never used to use that at all, because I couldn't understand it. It was not set up, as I thought, right.

Q. (By Mr. RICHARDSON.) Which side of the dam did you

measure from?

A. From the side next to Lawrence street.

Q. There is a trifling inequality in the dam, isn't there? When

it is exactly flowing over, it will be a little higher at one end than

the other, will it not?

A. Yes, sir; but I took it at the lowest place. There is a little jog of about three inches in the dam where it runs out a little ways, and I used to take it at the lowest place.

WALTER H. McDaniels, sworn.

Q. (By Mr. Butler.) How long have you been employed as acting superintendent at the Wamesit Power Company?

A. I have had an active connection with it since 1868, a little

before the first of October; about eight years.

Q. And you are there now?

A. Yes, sir.

Q. The business of the Wamesit Power Company is simply letting power, isn't it?

A. Yes, sir; and furnishing it. Q. It carries on no manufacturing itself?

. A. No, sir.

Q. How many different buildings has it in which it lets power?

A. It has about forty buildings, speaking roughly. I should want our plans to give you an accurate count. But they are not forty different concerns.

Q. The first building, commencing at the top of the canal, is

used by the saw-mill?

A. Yes, sir.
Q. What time in the year was that used? A. Principally in the fall, winter and spring.

- Q. When was it allowed to run, as regards the water flowing over the dam?
 - A. When we had water to spare.

Q. And no other time?

A. No other time.

Q. What is the next mill below that uses the water?

A. The acid works of Taylor & Barker use the water, but they have no power; they use it for chemical purposes.

Q. Do you know about how much they use, — the size of the

pipe?

- A. They use a six-inch pipe, and I think another; but it is a small head; I think they use about one horse-power.
- Q. You rate your power, do you not, at a horse-power for every half-foot of water over the fall?

A. Not up there.

Q. But you rate your power at your full fall at half a foot per horse-power, do you not?

A. It has been our custom to. Q. What is the next mill?

- A. It is a shoddy mill, we call it. E. Hapgood & Sons, mattress manufacturers. They pick some sort of rags to make mattresses.
 - Q. What power do they use there?

A. We have rented 22 horse-power. That amount is rented and paid for; not in that place alone, sir, but from that wheel.

Q. That runs by belting carried into another building?

A. Into a building just opposite it.

Q. What is the head there? A. I can't tell you, sir.

Q. Considerably less than below it, isn't it?A. Oh, yes, sir.

Q. About how many feet — ten, fourteen, or fifteen?

A. It varies from ten to twelve, I think.

Q. What are the restrictions, if any, upon their running?

A. We had a right to stop them when the water was not running over the flash-boards, giving them permission to run nights to make it up.

Q. What is the next below that?

A. It is the Carter place, to which the Hiscox File Company is attached, or was. William H. Carter, wool-washer.

Q. How much does he use? A. We rent him ten horse-power.

Q. What fall has he, about?

A. Not much more than the one above. I can't say, sir; ten or twelve feet.

Q. When does he run? A. He runs the same.

Q. Nobody above Faulkner's runs except when there is a surplus of water?

A. No, sir; we have a right to stop them. We did whenever

we found need of the water.

Q. Then what is the one next below?

A. J. Hiscox hired eight horse-power from that same wheel, in addition to Carter, and I think used more. We never had an opportunity to weigh him up; he had very heavy machinery.

Q. You have spoken of weighing. Have you weighed out the

power to the several tenants?

A. No, sir.

Q. Then next comes Faulkner. He has 50 horse-power; hasn't he 25 cubic feet?

A. He has what he bought; I am not prepared to say that.

- Q. Then next is the Chase mill; then the Sterling. Now, how is the Sterling mill situated on the canal in regard to being situated at a bend?
- A. It is situated so that its flume very nearly runs with the current; that is, it faces the straight part of the canal, running up towards the dam.

Q. Whether they can draw water as long as or longer than any-

body else?

A. It has been the universal impression that they could.

Q. And is it yours?A. Yes, sir.

- Q. Then the next mill is which?
- A. The American Bolt Company. Q. They have 36 feet of water?

A. I believe so.

Q. Then the next is the Belvidere Woollen Company?

A. Yes, sir. Q. They have how much?

A. 27 feet.

Q. Then the next?

- A. There is a collection of buildings belonging to the Wamesit Power Company. We lease them.
- Q. They own the buildings and lease the buildings and lease power with the buildings?

A. Yes, sir.

Q. What is the next mill?A. There is a small building used as a machine shop.

Q. How much power do they have? How much is the highest amount you have let to them?

A. It is just the same now it always was; two horse-power.

That is guaranteed all the time; it is all good power.

- Q. All the Wamesit horse-power that are let are guaranteed during the working hours of the day through the whole year, in the leases?
- A. They are. When a guarantee is required, we make it good with steam, beginning at this point.

Q. And you make it good by the addition of steam when you

are short of water?

A. Yes, sir. Q. What is the next one?

A. William H. Carter, again; a cluster of buildings. He pays for 12 horse-power.

Q. What is the next building?

- A. I can't give these in succession; they are all spread round. I can tell you all the rentals in that place if you want me to. I will take them as nearly in order as I can. Jenks & Co., shuttlemakers.
 - Q. How much power do they have?

A. They pay for eight horse-power.
Q. What is the next?
A. The United States Cartridge Company.

Q. How much do they have?

- A. 20 horse-power.
- Q. What is the next?

A. John Walch.

Q. What does he do?

A. He isn't there now; that building is vacant. We rented him 13 horse-power.

Q. What is the next?

- A. There is a blacksmith's shop with a fan, which takes one horse-power; they pay for one.
 - Q. What next?

A. A cotton-mill.

- Q. How many horse-power went with that?
- A. 71 horse-power in three buildings.

Q. What next?

A. George Naylor, carpet manufacturer.

Q. How many horse-power?

A. He pays for 20. He has water in his dye-house besides, which certainly is not reckoned in that power.

Q. How much does he use in his dye-house?

A. One horse-power, certainly, dyeing, washing and scouring; probably more.

Q. What next?

A. The Bunting Company. Q. How much do they have?

A. 50 horse-power, besides water for scouring and dyeing.

Q. How much do they use for scouring and dyeing? A. Two horse-power.

Q. What next?

A. There is a machine shop, with four horse-power - John McCann. It is not run now.

Q. What next?

A. Hart & Co. They pay for three.

- Q. I observe that you put a little emphasis on the word "pay."
- A. I cannot tell you how much they have; I think almost all of them have more than they pay for, but I may be incorrect about that. One naturally gets into that notion.

Q. Who next, sir?

- A. That is all that is rented.
- Q. Part of those mills are not now running?

A. No, sir.

- Q. How many horse-power have you altogether there, sir?
- A. 246 is the net horse-power paid for, I think. I have mentioned the water taken for dyeing.

Q. Is that added in?

A. That is not included; that is comparatively small.

Q. About four or five horse-power?

A. Probably.

- Q. (By Mr. Richardson.) That includes some that is only used when the water runs over the dam?
- A. Yes, sir; I may say that that restriction has been very seldom enforced, I do not think that all those companies that have that restriction, during my connection with the Wamesit Power Company, have been stopped a month during eight years. I don't think so; but that may be a mistake.

Mr. Richardson. I think that has a tendency to explain.

Mr. Butler. Undoubtedly it has.

Q. (By Mr. Storey.) You mean, taking all the time, it would not make more than a month?

A. All the time. It may be more; I can't tell.

Q. (By Mr. Butler.) Practically, nobody shuts down his gates when the water comes down in the canal?

A. No, sir, I never knew them to, except the Wamesit Power Company, and they had to.

Q. As long as there was any water coming by a man's mill, he took it; that was so, wasn't it?

A. Yes, sir.

Q. Well, the Wamesit had, beside its surplus power, 68 cubic feet belonging to them?

A. I so understand it.

Q. Whenever you are short of water you supplemented the water with the engine, didn't you?

A. Yes, sir.

Q. Have you ary means of telling how long you ran your engine in any year?

A. Yes, sir. Q. Will you give the commissioners that? In the first place, how many engines have you?

A. Two.

Q. What is their capacity?

A. We rate one engine at 125, and the other, which is a double Corliss engine, I have always rated at 350; we have never tested I was told that that was its capacity. We bought it for that.

Q. The 350 horse-power engine was not put in until after the

taking of the water in 1872?

A. It was started July 7, 1873.

Q. Now, won't you tell the commissioners, going back to July, 1870, and coming down to July, 1876, how long you ran your engine?

A. I can give it to you from my books, but not now. I did not

know what you wanted.

Q. How soon can you give it to us?

A. It will take me about an hour to calculate it. I have the number of days in which these engines were run, both of them, in a year, from the 1st of October to the 1st of October.

Q. For how long?

A. The Wright engine from 1868.

Q. You need not go back any farther than 1870. I should like

to have you give us that, after the recess.

A. I can give you the Corliss engine now. That was started on the 7th of July, 1873. In July, 1873, it ran 25 days. runs at night, or anything of that kind, I call it a day.

Q. Did you ever stop your wheels in the daytime for the pur-

pose of running your engine at night?

A. No, sir. I might say that the Corliss engine never has been run at night; but in my other table, when we were repairing the canal, the Wright engine was run at night, and I called a night a day, in making up the table in my coal account.

Q. I wish you would strike the nights out of the table, and put them in another place, so that everybody can have the advan-

tage of it.

A. The Corliss engine was run 25 days in July. I think there are some quarter-nights there; I shall have to look at that. I think there is some extra time in that month. I can't give you here the quantity of extra time.

Commissioner Francis. If we call $11\frac{1}{4}$ hours a day, we shall

have it?

Mr. Butler. Yes, sir.

Q. (By Mr. Russell.) Do you mean that it ran all day 114 hours, whenever you have got a day down?

A. At that time 11 hours was a day with us; it is not now.

Q. Then you do not mean that these are the days on which it

run, but that it actually ran a day's work?

A. A day's work; and there is some running over to make up time. We had to stop in order to put in this engine and connect it, and that accounts for it; but to the best of my knowledge, except that month, we have not run any extra time with that engine. Eighteen days in August; seventeen and a half days in September; six and a half days in October. It was not run again until November, 1874, six days in that month. It has been put on at different times and taken off. Six days running time; it is not necessarily successive days; twelve and a half days in December; twenty-six and a half in January, 1875; twenty-four in February; seven in March. Started in July, 1876, again, and ran nine and a half days; five and a half in August; fourteen and a half in September, this year.

Q. (By Mr. Butler.) When you ran the Corliss, did you run

the light engine?

A. When we started first in 1873, there were times when we did; and in 1875 the light engine was run for a few day. For a period of a year it has not been touched.

Q. When you ran the engine, did you run your whole works by it and shut down the water, or did you run it auxiliary to the

water?

- A. Auxiliary to the water, always with the Corliss engine; varying our water-gates raising them when we could get any more water, as the canal varied; and at such times it varies a good deal.
- Q. You only supply power from the steam-engine to those mills that you speak of, the Wamesit Power mills down below the Belvidere mill?

A. Yes, sir; that is all.

- Q. How much per horse-power did you rent this horse-power for?
 - A. \$75 a year per horse-power. Q. To those guaranteed parties?

A. Yes, sir.

Q. Has that been the continuous price since you have been there?

A. Yes, sir.

Q. You made an extra charge for rent of the buildings?

A. Yes. sir.

Q. Was the number of horse-power let the effective horse-power on the pulley in the building that the man was using?

A. We were supposed to deliver that power from our main line

in each building.

Q. The line of shafting ran through the building, and you delivered the power from that, so that the company was at the expense of the loss of power between the engine and the pulley that the man took his power from?

A. Yes, sir.

Q. Whether the extent of shafting and the number of buildings make the percentage of loss there very considerable?

A. Yes, sir.

Q. What percentage should you say would be lost in the Wa-

mesit Power Company's buildings?

A. It was a large percentage owing to the position of the buildings and the poverty of the appliances. I think it must have been one-third, at least, of all the power let.

Q. (By Mr. Shattuck.) That is, they paid for one-third more

than they got?

A. No, sir; they paid for what they got, and we, in order to give it to them, had probably to spend from 70 to 80 horse-power for nothing; we had to throw that away.

Q. (By Mr. Butler.) Have you got plenty of power to let

now, sir?

A. At present, yes, sir; our buildings, some of them, are idle. I have given you what we rented in those buildings.

Q. Was Mr. Tilton acting under your direction in measuring

the water?

A. I told him to measure it, having instructions from Mr. Farrington.

Q. Why was the hour between eight and nine chosen?

A. The desire was to get some hour which would be on the whole a fair one, as we thought, and Mr. Tilton's judgment was taken in that matter.

Q. Fair in what regard?

- A. Well, as to the average height of the water on the dam. left that to Mr. Tilton.
- Q. What time do you feel the water from Billerica when the water is low?

A. I can't say absolutely, sir. Q. Well, about what time in the day?

A. The middle of the forenoon, from ten to eleven, I should say.

Q. During any of these years that you have been speaking of, did they stop up at Talbot's dam, for the purpose of repairing the dam, or repairing the bulkheads?

A. I can't say; I have heard, several times since my connection with the Wamesit Power Company, of stoppages there, but I never had any knowledge of them.

Q. Have you found a sudden cessation of water?

- A. I have, several times. The water has dropped; but I can't tell from what cause.
 - Q. The water would suddenly drop?

A. Yes, sir.

Q. And remain in that condition some days?

A. Oh, yes, sir; so that we would have to put on steam.

Q. And then go on again?

A. I don't know. If you will allow me to look at my diary, which I kept, I think I can recall a case. [Witness refers to From July 6 to July 13, 1874, there was such a case; there may have been others which I have not noted.

Q. Has it been your business to observe the water for the purpose of starting the engine, or having it ready, to anticipate a

stoppage of the power by water?

A. Yes, sir.

Q. Have you carefully observed the state of the water from time to time?

A. Yes, without making any notes.

Q. Well, sir, what portion of the year do you say that the water runs over the flash-boards some part of the time?

A. About three-quarters of the time; nine months in the

year.

Q. What portion of the time should you say that it runs over all day?

A. Nearly half; nearly six months.

Q. Won't you now give the commissioners the best idea you can of how the water operates on the river, how you find it as regards steadiness in keeping on during the day? Just tell us all about it.

A. Well, during the time of the year when there is from eight to fourteen inches running over the flash-boards, I think there is a very slight change in the height of the water at the dam, between morning and night. My observations have not been positive, that is, in figures; but I have had occasion a good many times to compare the heights.

Q. At such times, does the amount of water from Talbot's make

any impression?

A. I should say not. It makes no impression upon our rough requirements. We have never had any engineer's measurements.

Q. It makes no visible impression?

A. No, sir; when the river becomes dry, it is apt to drop pretty suddenly, I think.

Q. By "dry," you mean how low?

A. In dry times, when there is but very little water running in the river. We suppose ourselves to have plenty of water or a fair supply, the water keeping about even with the flash-boards, and in three days it may get low. That is, it will run along even with the flash-boards for a series of days, and then unexpectedly drop. That is, it has been unexpected to me several times. When there is a fair quantity, and a little surplus in the early morning, running over the flash-boards, — when there are from two to three inches running over the flash-boards in the morning, just after starting up, say 11 o'clock. I think we keep full all day. It is even with the top of the flash-boards at night.

Q. Well, sir, at such times, does it fill up at night so as to run

over by morning?

A. I never knew it not to, except one year, that was a very dry time; I have forgotten the year. That was when we put in our head-gates. I think it was 1870. I ought to say, I have nothing to call me to the head-gates regularly, and my testimony on this point is not from what I have seen. My impression is that it always runs over the dam.

Q. At any rate, that is what you act upon?

A. Yes, sir.

- Q. Have you ever been down the road from Lowell to Billerica?
 - A. Yes, sir.

Q. Many times?

A. Several.

Q. How far is it?

A. I am no judge of distances; I can't tell you; I should have set it at four miles. I go over one of the roads very often, the Cemetery road.

Q. That is the eastern road?A. The eastern road.

Q. That runs pretty nearly parallel with the river, don't it?

A. Well, no, the river bends away from it. I think the river runs nearer the other side, the Fair grounds side.

Q. How is the stream as to sensitiveness to rain? When there

is any considerable fall of rain, is it easily felt?

A. I have been surprised about that. I have expected the river to rise when it has not, on account of rain; on the other hand, it has risen when I have not expected it. I have frequently watched for a rise in the river on account of rain when it has not risen.

Q. And then it has risen when you did not expect it?

Q. Whether or not that shows you that it was controlled by the gates above?

A. I don't know.

- Q. Are you ever troubled at the Wamesit Power Company with
- A. We have never been absolutely stopped by back-water; we are troubled with it; we have back-water.
- Q. I see you ran the engine in March, 1875. Was that on account of back-water, or because you were short of water?

A. I can't say; I might tell by referring to the table.

Q. Whether this engine has ever been run at any time, not for want of water, but because the anchor or other ice has filled the canal?

- A. Yes, sir.
 Q. Whether or not that is the most frequent cause of running it
- A. I can't say now. I think it is the case more than half the time, and it may be more than that. I can tell you better after looking over the records.

Q. Except the times you have put on the engine, have all the works of the Wamesit Power Company, when they were full, been

carried by the water-power?

A. We have carried all the power that I have given an account

of this morning by water alone.

Q. Now, from your connection with the stream, and your knowledge of it, what portion of the year should you judge it would afford water enough to carry 250 horse-power at the Wamesit mills?

A. To sell at 250?

Q. Yes, sir. Let other people go on as they do, what part of the year, in your judgment, would the Wamesit Power Company's works of 250 horse-power be carried?

A. Do you mean, what part of the year we could get that much

power, or sell that much power, for you know I said there was nearly 33 per cent. of loss?

Q. I mean, sell that much power?

A. Nearly six months, perhaps more. Since I have been connected with the Wamesit Power Company there has been a great deal of variation from year to year in the water running in the stream. One or two years it has not been like the rest at all; but I think six months would be my judgment.

Q. Reckoning in addition the amount of power lost by trans-

mission?

A. Whatever it is.

AFTERNOON SESSION.

WALTER H. McDaniels, resumed.

Q. (By Mr. BUTLER.) Can you give us now the time since 1870 when the Wright engine has been run?

A. These figures are from October 1 to October 1. From October 1, 1870, to October 1, 1871, it was run 97 days and a half.

Q. How much of that time on account of repairs?

- A. There were 14 and a half days when it was run when there was no water in the canal. In other words, there were 83 net days in that year.
- Q. (By Mr. Storer.) Do I understand that that means the aggregate number of days, taking half a day here, and three-quarters of a day there, and so on?

A. Yes, sir. From October 1, 1871, to October 1, 1872, we

ran the Wright engine 146 days.

Q. (By Mr. Butler.) How many out for repairs of the canal

that year?

A. I cannot say accurately, but a period from October 1 to December 4 it was run because we were taking out one wheel and putting in another, that is about fifty days; and from December 19 to January 4 there are thirteen more days that I can pick out readily. I have not the data here to get all, but I am sure of sixty-three days out of that year for repairs.

Q. The next year?

A. From October 1, 1872, to October 1, 1873, there were $125\frac{1}{2}$ days.

Q. How much out for repairs?

- A. I cannot tell you, sir. We put in the Corliss engine that year, and after the Corliss engine was started it was deemed advisable to run in two separate places, not to connect, and we ran through from the middle of June to the first of September; we ran that engine when, I think, we did not need it, but we ran separately; that is, I think we would not have needed it. With the Corliss engine running on one side, we would not have needed the other.
 - Q. That is, you hadn't connected them together?

A. We hadn't connected them together, and we put steam on both ends.

Q. You cannot tell how much?

A. No, sir. From October 1, 1873, to October 1, 1874, the Wright engine was run fifty-nine days.

Q. Any repairs out of that?

A. None that I can pick out. From October 1, 1874, to October 1, 1875, the Wright engine ran forty-six days; twenty-three days out of that there was no need of running, except for making repairs. There was a break-down, and we were obliged to put this engine on in order to run. There was a break-down in this long line of shafting, and we made some alterations there. During the last year it has not run. We have started it and run it half a day at a time to keep it from getting out of shape, but not for power.

Q. Half a day at a time to keep it plumb?

A. Yes, sir; to keep it in shape.

Q. Before the Corliss engine was started in July, 1873, your only auxiliary power was the Wright engine?

A. Yes, sir; I wish to correct something in the testimony I gave this forenoon.

Q. Certainly, sir; get it right.

A. The question was asked me about our stoppages from anchor-ice, what proportion they bear to the stoppages during winter, that is, the running of the engine during winter, and I said, I think, half. It certainly was not over a quarter; about a quarter, I think, all the time when we ran the engine, because parts of the day anchor-ice would come down and trouble us.

Q. Then you would run the ice over the ice-run and get rid of it,

and start up?

A. Yes, sir; or the cold winds would stop and we would get rid of the ice. We could not scrape our racks clean early enough in the mornings; there would be water enough in the canal, but we had to keep our engine on for that purpose.

Q. How long a time did you say?

A. I say a quarter of the time during winter the engine ran from causes of that kind, rather than from lack of water. There was another cause for our running in the winter months, from our not having water enough, when it was hardly anchor ice. We had no way of getting rid of the ice that was in the Wamesit canal; the tenants above us would sometimes break the ice in the canal when it was a foot and a half thick, and shove it along, and it would dam us full; we could not get it out of our little ice-run fast enough; we used to keep a gang of men getting it over, and that complicates this matter, of course.

Q. When the water was dammed out by the ice?

- A. Yes, sir. But on the 26th of September, 1872, I effected an arrangement with the people above by which we kept the canal open, and were not troubled, I think, after that. We kept the canal open by working at night; we had men on at night and ran it over.
 - Q. Was the canal widened at any time?

A. Yes, sir,

Q. And deepened?

A. Yes, sir.

Q. When was that?

A. In 1870; at various times, but principally in 1870.

Q. At various times since 1870?

A. We have done a little.

Q. Before 1870, we stopped the larger part of one summer, didn't we, to dig out the canal?

A. I think that was in 1870, sir.

Q. Stopped the larger portion of the summer to dig out the canal and to put in new head-gates?

A. Do you mean that the water was out of the canal the larger

portion of the summer?

Q. Yes, sir.

A. No, sir; it was only for a short time; we had to draw it off at night and let the water in in the morning.

Q. How long a time was it stopped?

A. I think it was only stopped for five days.

Q. I don't think of anything I wan't to ask you further.

A. You asked me about the sudden rise and the sudden fall of the river, and told me to tell you.

Q. Yes, sir?

A. I only noticed two where I thought I could not account for it, and that was in July, 1872, when it went down and came up suddenly on the 22d, and July 6; I think I gave that before; it came up July 13, 1874.

Q. Any attributed cause, of shutting down or opening the

gates up above?

A. I do not know, sir; I didn't attribute any cause, I only noticed the fact.

Cross-examination.

Q. (By Mr. Shattuck.) There are 220 cubic feet a second absolutely sold by the Wamesit dam, as I understand it?

A. I don't know about that; I haven't the data with me, sir.

Mr. Shattuck. That was stated.

Mr. Butler. Yes, sir. That is so. Q. (By Mr. Shattuck.) The Wamesit Company owns 68 cubic feet per second, does it not?

A. The Wamesit Company, I suppose, owns all the water that runs in the river. I don't know those figures, sir.

Mr. Shattuck. It has been stated so here; we will assume that.

Mr. Butler. That is, the Wamesit Power Company, when it is even with the top of the dam, have 68 feet?

Mr. Shattuck. I mean, 288 cubic feet of water per second. Mr. Butler. Yes, sir.

- Q. (By Mr. Shattuck.) The number of horse-power that you guarantee to all these parties is about 204, is not it, that you guarantee?
 - A. I suppose it is about that; I think that is right, sir.

Q. To furnish that power, you require about 102 feet of water per second, do you not?

A. If the rate of $12\frac{1}{2}$ to 25 is right; yes, sir.

Q. (By Mr. Butler.) No, no; you require more than that; you require a third more.

A. To run the shafting?

Q. Yes, sir.

A. But this is to give this power.

Q. (By Mr. Shattuck.) So that it would require 102 feet of water per second to furnish that, allowing that there is no more than the usual waste, would not it?

1. Well, I cannot follow your figures, sir; it looks as though it

would.

Q. You have stated here, that you allow for each foot of water per second, two horse-power?

A. Yes, sir.

Q. Now apply that, and to furnish 202 horse-power, would re-

quire 102 feet, would not it?

- A. If it took,—which I don't believe it does now, because we have been repairing—if it took about 33 per cent. of the net power to run our shafting, there would be 272 horse-power required at our wheel.
 - Q. And that would be how much?
 A. That would be 136 cubic feet.
 - Q. Now, do you mean by that, 136 cubic feet a second?

A. Yes, sir.

Q. Theoretical horse-power is a fall of one foot in eight-tenths, as I understand it. It falls here about 24 feet, so it is between 102 and 136 somewhere; that is 102 would be the minimum of the water required, and 136 would be the maximum; you say that, would you?

A. I should leave it for an engineer; I should only say I should

want 102 horse-power at the wheel.

Q. Then the Wamesit Company have, as I understand it, 68 feet out of the 288?

A. I so understand it.

Q. Then the Bleachery has 36, has it not?

A. I really have not these figures in my mind.

Q. Then the Bleachery uses, practically, how much?

A. It uses a good deal; the instant there is dry water they come to me about it.

Q. But they probably do not use more than a very few horse-

power, do they?

A. I cannot say as to that; my impression is, that they use a great deal of water at certain times, but at other times they use very little; but I have seen when they have drawn our water down at times.

Q. That may be from extraordinary occasions. How does Mr.

Wood work his machinery, when other people don't work?

Q. I think he works it regularly; my impression is he does; I think last year he ran all the year regularly; I have no means of knowing; I keep no watch upon him, but I have that impression.

Q. Well, the Belvidere has 27 horse-power, and hasn't run for how long?

A. I cannot tell.

- Q. Well, about how long? A. About two years, I think.
- Q. Well, then, you add twenty-seven, and when the Bleachery is not using its power, and Mr. Wood is not using his power, and you have sixty-eight, adding those all together it is 143 which you would have; therefore, if the Bleachery is not drawing, and Mr. Wood is not drawing, and the Middlesex is not drawing, you would have all the horse-power you sell and guarantee without having over 288 feet per second, would you?

A. I do not know anything about that; I have not gone over

those figures; I don't doubt but that you are right.

Q. Well, then, besides all these, your power is never all let, or has not been during the last four or five years?

A. We always are anxious to get more power, to save steam. Q. Has there been any time when all your power was let? I have no doubt you are anxious for more water.

A. When all our water-power, about all the capacity of our

wheels, is not let, is that what you mean?

Q. You have stated, for instance, that John Walsh used to hire 13 horse-power, and that is taken. How long has that been?

A. That has been taken for a year; but then there are other

people in it; we are constantly changing.

Q. Well, that is the fact, you are constantly changing; and has there ever been a time during the last three or four years, during the period which you have described, when all this power was actually used?

A. I really don't know what you mean. What power do you

mean; the capacity of the water in the canal?

- Q. No, sir; that is an entirely different thing. For instance, you say, machine shop, two horse-power; William H. Carter, eight horse-power; United States Cartridge Company, twenty-eight horse-power, et cetera; I should like to know if there has been a time when all those rooms were occupied, and all this power, 204, used?
 - A. Yes, sir; that has been all occupied and run at one time. Q. When was it last all occupied?

- A. I can hardly say that, sir; but about two years ago, I should think?
- Q. Some of these parties who hire power are practically the same persons in interest as those who own the Wamesit dam, are they not?

A. Not to my knowledge.

- Q. Well, they are parties who are interested? A. Oh! they are people interested in common.
- Q. Now, as to the leases. You let buildings and land, and water-power. Do you always specify so much for the water-power, and so much for the land, and so much for the buildings?
 - A. We always stipulate in regard to the power to be delivered?
 - Q. Now, then, can you tell me the rents that you receive from

some of these parties, for land and buildings, as well as for power?

A. Yes, sir. They vary greatly, according to their requirements.

Q. Take one that occupies a building?

- A. Yes. Well, the United States Cartridge Company, for instance.
 - Q. Well, that is a new building; take one of those old buildings?
- A. I will take several. The United States Cartridge Company pays \$1,500 for horse-power and \$3,840 for building and land.

Q. Do you know the cost of that building? I take it the books

will show.

A. I think it is fair to say that these buildings bring about 10 per cent. on their value.

Q. How much do you call the land?

A. I cannot tell you here, sir; I have not the figures.

Q. Is not really the value of the land dependent wholly upon the horse-power? Is there any instance where you let land without power?

A. In this particular case we let the land.

Q. How much is the land let for?
A. I cannot tell you the figures.

- Q. Is there any case where the land is put down as a separate item?
- A. Not in my copy. In here land and buildings are put down at \$3,840.

Q. Have not you any idea of how you value that land?
A. No, sir; I have not. I never had the reckoning of it.

Q. Now, is there any case, or don't you know the value of the land?

A. No, sir: I do not.

- Q. (By Mr. Butler.) Is there any other case where land is let?
- A. I am inclined to think not, because that is why I took this case.
- Q. (By Mr. Shattuck.) You own the buildings, and you let them?

A. Yes, sir; for so much.

Q. And of course that lets the land?

A. Yes, sir. Here is the case of J. S. Jacques & Co. The room, we call it, is \$500. It is a building with sufficient land for manufacturing purposes, for their purposes. There is a store-

house, right of way, et cetera.

Q. (By Mr. George S. Richardson.) Do you mean to say that that is separate in your leases? Is not there a gross sum named in your leases covering the land, buildings, and power? Don't the parties pay you a gross sum? Do they distinguish between the water-power and the land?

A. If they are going to take out machinery they are generally very anxious to say "We want more," and I say, if we don't care, "We will charge you \$75 a horse-power." I have had cases where they have taken out machinery by reason of the hard times.

Q. But in your leases it has all been for a gross sum?

A. Simply for horse-power; we let generally for a quarter.

Q. Don't you let the buildings and horse-power at a gross sum? For instance, a man comes to you and wants to hire a certain shop, and don't he take it for a certain price for the whole, and don't pay rent for the building and the land all in one, for the land and power?

A. I am inclined to think our quarterly bills specify the power used, but not in all cases; but the power is always separately negotiated for and charged separately. It may be charged "rent

for three months," and probably is.

Q. Do you let the cotton mills 71 horse-power and the blacksmith one horse-power at the same rent?

A. Yes, sir; \$7.

Q. Do any of them have written leases?

A. Yes, sir; they have had.

Q. What does that blacksmith pay for the rest of his premises?

A. \$100 for a building.

- Q. And what does the cotton mill pay for the rest of its premises?
- A. The cotton mill uses a good deal of power in a small space; they pay \$5,325 for power and \$1,012.50 for room; they had no yard room, and had one very old mill which was not considered worth much.
 - Q. You were crowded for room, and it is an object, I suppose,

to sell the power?

A. Yes, sir; it is an object to sell the power as quick as we could. For instance, "one mill and power" in that canal goes with the right to use 27 horse-power, and the whole thing was \$2,750. They had a right to use that, and then they had 36 extra horse-power more; they took that afterwards. That is how the extra horse-power came that way. It is a separate item.

Q. Are you an engineer?

A. No, sir.

Q. You are the general manager of the property; is that so?

A. My position there is accidental rather than anything else. I am interested in another mill, and, being there all the time, I have been given the work to do.

Q. Are you interested in any of these mills?

A. Yes, sir.

Q. (By Mr. Butler.) How much have the mills run nights this year; can you tell us?

A. Whose mills?

Q. Anybody's mills on the Wamesit dam, to your knowledge.

A. Excepting the Wamesit dam?

Q. No, including ours.

- A. I cannot tell you. The upper mills, the Chase and Faulkner, have run now and then an extra time, for which they pay, and one of the Wamesit Power Company's tenants has run nearly five months.
 - Q. Every night; twenty hours a day?

A. Pretty nearly. Q. Ending when?

A. Over five months now; I mean five months up to the 1st of

July. I think they ended early in September.

Q. (By Mr. Shattuck.) Have not the Bolt Company been running only a part of their machinery and only a part of the time last year?

A. They were stopped a part of the time, and then, I think,

they ran nights.

Q. That is, they ran nights in order not to use the power during the day?

A. No, sir; they got orders rather beyond their capacity.

Q. But it is an irregular thing?
A. Yes, sir; it is an irregular thing.

Q. What part of the time the last five years do you think they have used their 36 horse-power?

A. I could not tell you, sir.

Q. Do you believe they have used it half of the time? Would you estimate that they had used it half of the time?

A. Yes, sir, I would; and more, too.

Q. How much more?

A. I cannot tell you.

Q. But they have stopped part of the time?

A, Yes, sir; they have run half of the time sometimes, and then they have run nights in addition to the daytime.

Q. Then you make them pay for it when they run nights? A. I have the right to.

Q. Well, you do, don't you?

A. Yes, sir, I do.

Q. (By M. D. S. RICHARDSON.) You have had more power from the water since this last year, haven't you? The engine hasn't run at all since the last year, has it?

A. The Corliss engine has run a good deal.

Q. You said up to the last year the engine hadn't run at all?

A. That was the Wright engine.
Q. Up to how much power do you run the engines generally?

A. The maximum at any time?

Q. Yes, sir, ordinarily.

A. When we have to keep the engine on we will start with enough water perhaps, so that the engine is not doing anything, and then perhaps there will be a drain upon the engine to a certain extent from 10 to 4.

Q. Between what extremes do you furnish the power at?

A. Well, with this engine?

Q. And, during the day, which you have spoken of here, that you ran so many days, it might be one horse-power a day, or it might be 20, when you have run for several days?

A. We have run our entire works by steam, with all the wheels

shut down, in my experience.

Q. That is the highest. A. Of course that is the highest we have ever run by steam.

Q. Well, I mean ordinarily how much water-power do you average during the day, —those times you say you run by steam?

A. In the extreme drouths, between the middle of winter, say

when the snow will block us up and we have to run a great deal, and summer time when there is not a great deal of water, I suppose it averages from 100 to 120 horse-power, but it is very hard to say, sir.

Q. You have run one of your engines during this month?

A. October?

Q. Yes, sir.

A. No, sir; I don't think it has run.

Q. Did you in September?

A. Yes, sir; fourteen and one-half days.

Q. Were you running the day we were there? A. I don't know the day you were there, sir.

Q. We were there the 6th of September.

A. I cannot tell you that; I have not the engineer's record.

Q. Well, how much, on the 6th of September, of power was being used?

A. I should say probably -

Q. How much was running; I ask you that question?

- A. If the people were generally running that are now in our place?
- Q. That is just what I am asking you, the extent at that time; were the United States Cartridge Company running?

A. I cannot tell you, sir.

Q. Was the cotton mill running then?

A. No, sir.

Q. Was Naylor's running?

A. Probably.

Q. The bunting company?

A. Probably.

- Q. Now, is there any provision in your lease or letting, when they shall cease to use the water when the quantity of water in the canal is below 228 cubic feet?
- A. I don't think there is at all; they always go on, because we give them steam.

Mr. Butler. The tenant don't raise or lower a gate.

Mr. RICHARDSON. I know it; but if you allow them 246 net horse-power, as I have got you down here, you have only, when the canal is down to that plus 68 cubic feet or 136 horse-power with which to supply 246.

WITNESS. We have 376 horse-power of steam to always supply

it.

Q. Do you keep your engine fired up all the time?

A. We keep it fired up when there is a necessity. It is my business to watch the river and see when the engine ought to be got ready; sometimes we get caught.

Q. Let me see if I understand. Your calculations were that you have 246 horse-power. In delivering that power you deliver it at great disadvantage, don't you; long shafting and great distances?

A. We have very great disadvantages, and not a scientific arrangement of the shafting at the building, now.

Q. You carry it over the whole river, don't you?

A. We carry it over the canal.

Q. How long does your shafting run?

A. Well, there is a main line, to which there is no objection, about 200 feet long; but it is turning round corners, et cetera."

Q. Then you say you lose 33 per cent. in delivering the power which you sold at 246, and that must be added to it; and that leaves you 327 horse-power, more or less; that gives you 324 cubic feet a second, taking out what you have to supply, 96 cubic feet per second, which you have let and which you have to supply with your engine, if the canal is down to 288 cubic feet?

A. If we let that much; yes, sir. Q. And the engine has to supply it?

- A, The deficit of water, or what is left over the capacity of the river.
- Q. (By Mr. Shattuck.) How long is it since you have let up to 204 horse-power? For instance, how long is it that you have let the whole 71 horse-power to the cotton mill?

A. It is about two years or a year and a half since that cotton mill broke up, but other tenants have been in the place of it.

Q. How long has all this amount of power been let by the Wamesit Company?

A. All of that?

Q. Yes, sir; this 204.A. Well, it was let through that year.Q. Through what year?

A. 1873, sir.
Q. When was the first year it was let as much as that?

A. I don't know that as much as that was let.

- Q. How many horse-power was let prior to the time when the increase was made in the cotton mill?
- A. I cannot tell you because I have come here not knowing what you required: I was sent for by telegraph, and I have no data and cannot tell you.

Q. How long ago was that addition made to the power of the cotton mill?

A. I cannot tell that; they were running for a couple of years, but they didn't commence with so much power.

A. How much was the smaller power which they had?

A. They commenced, I think, for several months, with 27 horse-power.

Q. Then it increased to 71?

A. Yes, sir.

Q. Now, I want to know how long it is that they have been running with full 71 horse-power?

A. I said I think they ran through 1873.

Q. With the whole of 71?

A. Yes, sir; with the whole of it. They are tenants of ours, or their successors are now.

Q. Prior to that you think they did not run so much?

A. They did not run so much, but on the other hand the United States Bunting Company ran more, which is now set down at fifty.

Q. How much did they have?

A. They had over sixty at one time and paid for over sixty.

Q. You say this power has been used substantially as much as two or three years; has been let, I mean?

A. Yes, sir, with variations. I cannot say exactly, but nearly

that.

Q. (By Mr. D. S. RICHARDSON.) How large is your wheel which furnishes power at the flume?

A. There is a 42-inch Warren wheel, and a 42-inch Swayne.

Q. How much is the power of the wheel?

A. It would be somewhere between 250 and 300 horse-power where we sell the power.

Q. The last place before you get to Wood's?

A. Yes, sir.

Q. Now, do you put on steam and stop the water, or take all the water you can get there?

A. We don't often stop it; but when the Bleachery and Wood's

cannot run we have to put on steam.

Q. Did you see it on September 6th (it was down below the top of the dam, September 6th)—did you see it during that day when there was not much current towards our mill?

A. I cannot tell you; I don't know that I saw the water that

day at all.

Q. (By Mr. BUTLER.) The day we were there?

A. I don't know that I was there; I didn't see you there.

Q. (By Mr. D. S. RICHARDSON.) I mean when the water goes down do you shut off the water which you deliver by your wheels to the Wamesit, or do you let them take what they can get?

A. We invariably shut our gates down and take off one or two wheels when our engine is on, because it is a great waste of water

to run it through the wheels.

Q. How low must it be down before the water is wasted?

A. That would be for an engineer to tell you. My opinion in the working of the wheel is that this is the way to keep the head up rather than run it all away, and we do that.

Q. Suppose the level of the water was only a foot and a half from the bottom of the canal towards Wood's, would you have any

power delivered by your wheels above?

A. I should think so, if it held a foot and a half.

Q. Now, when you find it down to a foot and a half, do you take any measures in checking the use of the water in the canal,

or take all you can get?

A. My practice is to run, as I think, with the greatest economy; I certainly don't do it for Mr. Wood's sake, but there is practically a division in favor of Mr. Wood in the Bleachery, because I always take off some of the wheels and shut down the gates.

Q. Is there practically any division in the water, according to these grants and leases, so that they can have just the amount of

water they are entitled to?

A. I have not heard of any above us.

Q. When the water gets down so that you are entitled to 68 cubic feet are you careful to supply the other 96 cubic feet with steam, or do you take such water as comes, and then make up the balance with steam?

A. We always run so long as we can with water.

Q. You take all the water you can get, so long as you can, and supplement it with steam when you cannot get the water?

A. Yes, sir.

Q. And you do that without any division in the quantity of water among the owners, or without regard to what is above or below?

A. Yes, sir.

Q. (By Mr. Butler.) You assume that all that has been taken

above you belongs to you?

A. I have always assumed that there was more water taken above us than there was any right to be taken; I have a right to assume that we have a right to take all we can get, and we don't get our share.

Q. (By D. S. RICHARDSON.) Do you mean to say that you assume that you can take all the water you can get, without giv-

ing the Bleachery or Wood's a drop?

A. I take all the water I can get, because I don't get enough.

Q. Do not you know that they have rights below you?

- A. I don't know anything about that. My supposition is that we haven't used more than our share.
- Q. (By Mr. Butler.) At one time a suit was brought, was there not, against Mr. Wood for using more than belonged to him, and against Mr. Faulkner; and we made an endeavor then to have the water divided which failed, did it not?

A. I believe so, sir; I don't know.

Q. And finding that that was fruitless, we all concluded to let

it go. "Catch you catch who can."

- A. We never were permitted to make any observations of other people's flumes until the law-suit was brought; we were afterwards.
- Q. (By Mr. D. S. RICHARDSON.) Have you not refused to have your flumes measured?

A. I don't know that they have, sir.

Q. You take all the water you can get while it is in the canal, if you need it for your purposes, without leaving any there to go below, or taking any measures to have any there to go below?

A. If I said yes to that it would not be hardly fair; it would

not really be my position.

Q. Well, explain it?

A. I have explained it; I simply refer to my morals in the matter, not to the actual fact. The fact is, that our practice is to restrain the use of the water on our part, by the shutting off of certain wheels and using only a little, and that in practice keeps the head up.

Q. Now, don't you know that while running above, the canals

have been dry at Wood's and the Bleachery?

A. I know while the Bleachery has been running the Wamesit canal has been dry.

Q. While it was running with water?

A. No, sir; never with water.

Q. You never knew the time when it was dry at Wood's and the Bleachery?

A. No, sir, never; or any approach to it.

Q. Have you not known times when the Wamesit dam could run with water, when the Bleachery and Wood's had no water?

A. I don't think so; never, sir.

Q. Please to state whether the flume of the Wamesit Power Company is not a good deal lower than the bottom of the canal?

A. I cannot state it, but I don't think it is.

Q. Have you ever been applied to to clean out the sand which has collected on the bottom of the canal?

A. No, sir; I have not.

Q. You know there is some sand there, below your flume?

A. There is sand all along the canal, but I never heard a word of being applied to to clean out sand in our flumes until to-day.

BERNICE S. HALE, sworn.

Q. (By Mr. Butler.) Mr. Hale, what is your age?

A. 67 and going on 68.

Q. Born at what is known as Hale's mills?

A. Yes, sir. Q. You now live in Lawrence?

A. Yes, sir.

Q. Were the mills on River-meadow brook ever a flouringmill?

A. Yes, sir.Q. Did you carry it on?

A. Yes, sir.

Q. From what time to what time as a flouring-mill?

A. Well, it was a flouring-mill from 1836 or the latter part of 1836, up to 1845. Our flouring works were taken out then.

Q. Did you grind corn besides?

A. Yes, sir,

Q. How many run of stone had you?

A. We had two run of stone. It was a corn-mill before we turned it into a flouring-mill; we ground corn only.

Q. Did you bring the wheat from the West to supply it?

A. Yes, sir.

- Q. How many barrels of flour were the largest amount you turned out in a day?
 - A. We turned out about 50 when the weather was favorable.

Q. Did you run day and night?

A. Yes, sir.

Q. You ran all the time?

A. Yes, sir.

Q. Did you have any steam?

A. No, sir.

Q. The power was supplied by River-meadow brook?

A. Yes, sir.

Q. During the time that it was a flouring-mill, when you had the two run of stone, how much of the time did you run that mill day and night? How much of the time of the year, by Rivermeadow brook?

A. All excepting about two months in the year; two months in the summer season we were short of water.

Q. You were not short except two months, and two months you run part of the time?

A. Yes, sir.

Q. And shut off your machinery, and shut down according to whether the water ran up or down?

A. Yes, sir.

Q. Do you know Mr. Whipple?

A. Yes, sir.

Q. A man in active business for a great many years, well acquainted with water-power, owning a great deal?

A. Well, some quantity I suppose. He had some queer

notions.

Q. Did he run mills in Portland, and here and elsewhere?

A. Yes, sir.

Q. Do you remember the year he died, sir?

A. No. sir.

Cross-examination.

Q. (By Mr. D. S. RICHARDSON.) You have not worked upon it since 1845, have you?

A. Not since 1848.

- Q. Well, the power has diminished to some extent in that brook?
- A. I should judge it had. The canal was taken away since I left it.
- Q. There used to be a good deal of quarrelling with the canal about the water in your day, was not there?

A. I don't recollect it.

- Q. Somehow or other the canal used to be serviceable to help water there, didn't it?
 - A. Matthews said he would give \$5,000 to have it back again.
- Q. Now, has not the Middlesex canal been entirely dry where it crosses this brook?

A. Yes, sir; since I have left.

Q. Since you left the canal was entirely abandoned, so that no water could come from that source?

A. Yes, sir.

Q. And you don't know the particular power now, sir, I suppose?

A. No, sir.

D. W. C. FARRINGTON, sworn.

Q. (By Mr. Butler.) Have you been chief manager of the Wamesit Power Company, and for how many years?

A. I have, in the neighborhood of ten years; about eight or ten,

it may not have been ten.

- Q. The canal was widened at one time and deepened, was it not?
 - A. It was.
- Q. New and larger head-gates put in, and the dam put in repair?

A. Yes, sir.

Q. Do you remember what year that was?

- A. The canal was enlarged probably in 1872; the head-gates later; I should think it was in 1874, if I recollect right.
- Q. Prior to that time was there any trouble in the canal's carrying water?

A. There was.

- Q. Whether with the water running over the flash-boards of the dam the canal would or would not bring down water to the Wamesit Power Co., below the Belvidere mill?
 - A. It would not; the water did not come there.

Q. It did so, did it not?

A. Yes, sir. Q. It didn't come down?

A. No, sir.

Q. In consequence of the failure to get water at that time, was there any engine put in?

A. There was.

Q. After that, whether the Wamesit Power Co. widened and deepened the canal?

A. They did.

Q. Substantially from the dam down?

Q. Who was the engineer employed to make the surveys for that purpose?

A. Mr. Herschell.

Q. At the same time that the repairs of the dam were going on, were suits brought against some of the water takers, to test the rights and to try and get a division?

A. There were.

Q. And some changes were made in the wheels of the Chase Co., and of the Faulkner, were there not?

A. There were changes.

Q. And Mr. Wood at that time changed his 40 horse-power wheel to a 21?

A. He did, substantially.

Mr. D. S. RICHARDSON. You don't mean to 21, but you mean to 25 horse-power?

Mr. Butler. Well, substantially. That is, he made a change there from a 40 horse-power wheel to a 25 horse-power wheel.

Q. How much of your time have you spent there for the last four or five years?

A. All my time.

Q. Had occasion to know about it; how much was going and how the water stood, and how it was running?

A. Yes, sir.

Q. Give us your opinion, in the first place, whether there has

not been a larger amount of water-power used by those above the Wamesit wheels than their deeds call for? You know what their deeds call for?

Mr. Storey. We object.

Mr. BUTLER. What is the objection?

Mr. Storey. I don't see that it is at all competent to show.

Mr. Butler. Why not?

Mr. Storey. What the use of the water was.

Mr. Shattuck. If he has measured it or has an opinion in regard to it?

Mr. Butler. Well, pardon me. He has the means of know-

ing.

Q. You know what the deeds called for?

A. Yes, sir.

- Q. Very well. Whether more was used than the deeds called for?
 - A. It was always my belief that there was more used.

Mr. SHATTUCK. It is wholly incompetent.

Q. (By Mr. Butler.) How much in excess of the 220 feet, which they called for, do you think?

A. I should think at times they would use 50 feet more.

Q. Now, sir, did you ever know anybody on that dam above the Wamesit Power Company shut down their gates so as to take only a small part of the water, an aliquot part of the water, when the water was below the proper height?

A. No, sir; never did.

Q. Now take the Sterling mill; whether they, situated on this bend, were able to draw water lower than anybody else?

A. They could.

Mr. SHATTUCK. What is the object of this?

Mr. Butler. The object is to show that you would not be

damaged if we should take all the water but the last drop.

Q. Now, sir, whether, in order to equalize the flow in behalf of the Wamesit Power Company, you did not afterwards deepen and open the canal between the Sterling mill and the Wamesit wheels?

A. I did do so.

Mr. Shattuck. The precise statement is not that we use more than we are entitled to when there are 288 feet, but that our flume is so situated that the water may go into it when it is not going into the other mills.

Mr. Butler. I understand.

Q. Whether, from your surveys on the canal, the lowest point of taking water is the Sterling mill?

A. It was the lowest, and I don't know but what it is now.

Mr. D. S. RICHARDSON. Do you mean that the last drop would

run there?

Mr. Butler. Yes, sir.

Q. Would not the water run from Lawrence-street bridge? Suppose we got the last drop, would not the water run back into the Sterling mill flume?

A. A short distance above the bridge only.

Q. Now, sir, I desire to ask you how much you have had occa-

sion to observe the water in the river; whether it was running over the dam or not?

A. From time to time I have done so frequently.

Q. How much of the time, in your judgment, has the water run over that dam, year by year, take one year with another, some part of the day?

A. For how far back, sir?

Q. Say, go back to ever since you have been there, averaging the time. Mr. Faulkner went back to 1864; you can only go back to 1866. Say for ten years.

A. Well, sir, I should say, that, taking the whole time, for nearly

300 days in the year water had run over.

Q. (By Mr. Shattuck.) Sometime in the day?

A. Sometime in the day.

Q. (By Mr. BUTLER.) How large a proportion of that time would it run over all day during that period?

A. Well, I can hardly say, but between two and three hundred

days — somewhere between tow and three hundred days.

Q. Over two hundred, then, you think?

A. Oh, yes.

Q. Whether you are, in behalf of the Wamesit Power Company, prepared to let or guarantee power to 150 or 200 horsepower, or more?

A. I am, at \$75 a horse-power.

Mr. STOREY. We object.

Q. (By Mr. Butler.) How much per horse-power?

Mr. Storey. We object. That is not competent. Commissioner Russell. Is the object to show that these parties can supply themselves from this company with horse-power?

Mr. Butler. Yes, sir.

Commissioner Russell. That is a question which has not been raised. Do you object to it on that ground?

Mr. Storey. Yes, sir. If they want extra horse-power they

can have it at \$75 from this company.

Mr. Shattuck. Was that ever recognized as a proper way to treat the value of anything, to have a man come and say this?

Commissioner Russell. I think not.

Mr. D. S. RICHARDSON. I think there are cases where it has been ruled out, where the value of real estate has been offered to be proved by an offer which had been made to sell it.

Commissioner Russell. I suppose you can show at what rate horse-power can be furnished generally, but not that any one par-

ticular party is willing to furnish it at that price.

Mr. Butler. Contemporaneous sales, I take it, we can show. Commissioner Russell. I think the value of horse-power at Lowell can be shown.

Mr. BUTLER. I will take it both ways.

Q. What has been the price of horse-power at the Wamesit dam for the last ten years?

A. Seventy-five dollars.

Q. Ever any more charged?

A. No, sir.

Q. If guaranteed, any less?

A. No, sir.

Q. That with the tenant paying a price for the room to use it, or a room being furnished him for that?

A. He always pays for the room in addition.

Q. About how is that reckoned? How do you reckon your room rent? If a man wants to hire a shop and wants five horsepower, how do you get at the room?

A. Well, it depends somewhat upon the quality of the building,

but somewhere in the neighborhood of eight cents a foot.

Q. Eight cents a square foot for surface and shop room to use?

A. Yes, sir; for rent.

Q. (By Commissioner Russell.) Suppose you let two squares, it would be sixteen cents for your land, would not it?

Q. (By Mr. Shattuck.) Most of the buildings, how high are they?

A. They run from ten to twelve feet.

Q. (By Mr. Butler.) If he had one floor, it would be then eight cents for that floor? If he had the next floor, and it was equally good, it would be eight cents for that floor, and so on?

A. Yes, sir.

Q. Now, there are a very considerable number of mechanics' shops and mills running in the city of Lowell, are there not, furnished wholly by steam-power?

A. There are. Q. What is the price for steam-power down in the city?

A. From one hundred to one hundred and twenty-five dollars.

Q. Independent of the room?

A. Yes, sir.

Q. And that irrespective of the amount of power required?

A. Yes, sir.

Q. The more power the cheaper, I suppose, and the less power the dearer?

A. Yes, sir.

Q. What was the price of coal in the city of Lowell, up to this year, for the last five years?

A. In round numbers, between seven and eight dollars; it

would not vary a great deal from that.

Q. You have run engines and steam-boilers here at the Wamesit dam. Will you tell me what is your estimate of the cost of a horse-power, or steam, independent of the plant?

A. Well, sir, I should say in the neighborhood of fifty dollars

on an average.

Q. And the plant; and then the difference between fifty and seventy-five dollars or one hundred dollars, as the case might be, you look for your profit and interest on the plant and depreciation, don't you?

A. Yes, sir.

Q. Is there in Lowell steady power to be acquired to the amount of a hundred or two hundred horse in amounts not less than fifteen horse?

A. I think there is not; I don't know of any such place.

Q. Is there any difficulty in its being found at the Wamesit dam, if anybody applied?

Mr. Shattuck. I object to that.

Mr. D. S. Richardson. I object to that, because it looks in the nature of an advertisement.

Mr. Butler. I have no hesitation about this. I want to show, in the opinion of this gentleman, as a practical man, for the Wamesit Power Company, he would be glad to build a building, and put it right there, and let it right under these gentlemen's noses for seventy-five dollars a horse-power; and this company which he represents get their living in that way.

Mr. Shattuck. I understand the commissioners rule that out.

Commissioner Russell. In regard to that particular company; but that the price is such, or that the condition of things in Lowell is such that power can be hired there, we do not rule out.

Mr. Shattuck. Of course we do not object to showing what

the price of power is.

Commissioner Russell I suppose it is open to the counsel to argue that it would not be necessary for each man to replace the power in his own establishment by a steam-engine of his own, but that at the place where this deficiency of power existed there would be, in the ordinary course of things, steam-power accessible, which would be furnished at a price. The practicability of getting it to his mill is another question.

Mr. D. S. RICHARDSON. Also, if he puts in the evidence that there is no possible power run it would give a good margin for profit, because when the bargain instead of being seventy-five

dollars, it might be one hundred dollars or more.

Commissioner Russell. I don't think it is admissible to show that the Wamesit Power Company is ready to furnish it at one price or at another.

Q. (By Mr. Butler.) To any and every body? I want to

know.

Mr. Shattuck. That would not be competent.

Commissioner Russell. It is not like the case of a mill remote from all civilization where if you take away five horse-power, there could be no possibility of replacing it without putting in a five horse-power engine.

Mr. Shattuck. I have no doubt they can show the amount of power there, and the price of power there, but what this particular

company is willing to do, I don't think that is competent.

Commissioner Russell. I don't think that is competent.

Mr. Butler. I ask, whether where these mills are situated, that power, from one hundred and fifty to two hundred horse-power, could be guaranteed at seventy-five or one hundred dollars a horse-power, steam or in any way.

Mr. SHATTUCK. That is not competent.

Mr. Butler. Delivered in a competent building?

Mr. Shattuck. That is not competent.

Commissioner Russell. Delivered at the mills of these parties, I take it, should be the question.

Q. (By Mr. Butler.) Now, then, assuming that each of these mills would require an average of twenty horse-power additional, what do you believe, from your knowledge of things at that place, that power can be furnished to each mill for? Now, Mr. Faulkner wants 20 more than he has got; Mr. Chase wants 20 more than he has got; Mr. Sterling wants 20 more than he has got, and so on: what do you believe now, with a fair cost, can twenty horse-power be furnished for?

Mr. D. S. RICHARDSON. It is not a question of the cost. Commissioner Russell. At what price you mean?

Mr. Butler. At which price? And the price is no fair cost; they are not to make a profit on furnishing it. It is what it costs them to replace.

Commissioner Russell. If they have got to buy it, the price

that they have got to pay is the test, is it not?

Mr. Butler. Yes, sir. What a man has got to pay to furnish himself with horse-power, whether it is \$50, \$75, or any other sum.

Mr. D. S. RICHARDSON. I object to that because it includes the price of the contract, which involves the opinion of another man, and he cannot know it.

Commissioner Russell. We think, if it can be shown that steam-power is a thing purchasable in the market at this place, it is competent to show at what price it can be purchased, delivered at each of these mills in the amounts which each of them require. That is your question, as I understand it?

Mr. Butler. Not quite, sir. What a man purchases of steam power: the man that sells it proposes to make a profit upon it.

Commissioner Russell. Certainly.

Mr. BUTLER. Very well. Now, when a man supplies himself with it, the amount that it costs him to do it, without the profit,

is the true figure to take.

Commissioner Russell. I supposed you would get a much less favorable answer to that enquiry, and it would be so in a condition of things which I could imagine; but I think that it is competent for you to show for what a man can supply himself with that steampower.

Mr. Butler. I will put it both ways, because I have my own

belief about this immense plan for steam-power.

Commissioner Russell. Your proposition is what each man can supply himself with steam-power for?

Mr. Butler. Yes, sir. It is not a question of being for sale in the market.

Mr. D. S. RICHARDSON. Then we cannot get it.

Commissioner Russell. The only other way would be the expense of building the works and running them. You must either

buy it or make it.

Mr. Butler. Mr. Faulkner, when he comes to operate for himself and not to get money out of the city, buys a second-hand engine and puts it in for \$400, when he wants to operate for himself; when he wants to get up steam he requires then a \$10,000 or \$15,000 engine. Now I have got a practical man here, — I assume practi-

cal, — and I want to ask him what steam-power can be furnished in those mills for precisely as Mr. Frizell, who hasn't anything to do with steam-power in the world, but having experience as an expert, is asked what it will cost in wool waste and the engines and cotton waste.

Mr. Shattuck. Well, nobody objects to that.

Commissioner Russell. The question you now put is not objected to.

Mr. Butler. Well, then I will go right on.

Q. What can it be furnished for, sir?

Mr. Shattuck. Do you mean by that what it will cost, what the machinery to put it in will cost?

Mr. Butler. I mean what it can be furnished in the Sterling mill for, knowing its situation, twenty-five horse-power per year.

Mr. Shattuck. Do you mean what somebody else will furnish

it to them for?

Commissioner Russell. The witness, in answering that question, must inform us whether it is the price at which it can be purchased, and what it would cost the party to supply it himself there, because the two questions are put and one is objected to and one is not.

WITNESS. My opinion is that if the proprietors of the Sterling mill should undertake to supply the twenty horse-power to their establishment it would cost them \$1,500 a year to do it, and that is \$75 a horse-power.

Q. (By Mr. Butler.) By steam?

A. By steam.

Mr. Shattuck. If he means that he has made a calculation of what the engines, etc., would cost, why that I suppose is competent.

Mr. Butler. Now ask him all about it; he will tell you everything.

Cross-examination.

- Q. (By Mr. Shattuck.) When you say that the parties were taking more than their 220 feet of water a second, to what time do you refer?
 - A. I refer to the time whenever the water Q. During the last two years do you mean?

A. Oh, at various times during my experience there.

Q. Do you mean at any time during the last two or three years?

A. Yes, sir.

Q. Has the Belvidere mill been running any of that time?

A. Yes, sir.

Q. How long is it since that stopped?

- A. I cannot tell you exactly; it is over a year or a year and a half, I should think.
 - Q. About a year and a half?A. Somewhere along there.
- Q. Do you mean since they stopped that they have been running 220 feet?

A. No, sir.

Q. What did you charge to the Bleachery when you say they were drawing fifty feet per second more than they were entitled to?

A. I didn't charge it to any particular corporation.

Q. Do you mean to say that you made up the fifty feet without going into any particular estimate?

A. I can tell you how long they were drawing that.

Q. Just tell us?

A. When the water is at the top of the Concord dam I understand that the Wamesit Power Company is entitled to 68.81; in other words, that 68 cubic feet belong to us. I have seen the dam when that state of things existed, when the water was at the top of the Concord dam, when I knew there was not that amount of water coming down.

Q. Did you ever find out whether there was not 288 feet run-

ning?

A. No, sir: I never did. I assumed that.

Q. As I understand, your flume is above the Bleachery?

A. It is.

Q. And above Wood's?

A. It is.

Q. So that there was not 68 feet coming down there?

A. No, sir; there was not.

- Q. So that they were using 100 feet more?A. I have no doubt of it, at times.
- Q. Since the Belvidere mill stopped? A. No, sir; before that.

Q. Not then this year? A. No, sir; not this year.

- Q. Have not they tested all those wheels and ascertained that they cannot draw more than their share? You have had a lawsuit with them all?
 - A. No, sir; we have had a law-suit with two of them. Q. You have examined the other wheels in the flumes?

A. Not personally.

Q. Well, you employed somebody to do so?

A. Yes, sir.

- Q. And you found that they were not fitted to draw more than their proportion?
 - A. That was after some changes were made in the wheels.
 - Q. What was after some changes were made in the wheels?

A. This examination.
Q. How long ago was that examination made?

A. I cannot tell you; several years ago.

Q. Have you noticed they have drawn more than they were entitled to above you?

A. I have not noticed it so much during the last two or three

Q. Has there been a time, since the testimony was put in which goes back three years — when they have been drawing more than their share?

A. As I said, I have not given so much attention to it during the last three years as I have before that.

- Q. Would you give an opinion when, during the last three years, those mills have drawn more than they ought to have taken?
- A. I have not paid so much attention to it during the last three years.

Q. Then all your testimony relates to a time prior to these last

three years?

A. Not all of it.

Q. Would you give an opinion during these last three years when those companies have drawn more than they were entitled to?

A. I believe they have.

Q. When?

- A. When the water has been below, in dry seasons when it is below the dam.
- Q. Your evidence furnished us here was at a time when there were 288 feet running, and you say you did not get your 68 feet?

A. That was upon what I based my statement.

Q. And that you have not observed during the last three years?

A. No, sir; I have not.

Q. How much does the Bleachery take regularly?

A. They have no regular amount.

Q. Does the quantity of water they regularly take amount to anything material as power?

A. Oh, yes. Q. How much?

A. Oh, at times they draw very heavily.

Q. I mean regularly?

A. They do not take any water regularly; that term does not apply to their taking water.

Q. To what extent do they take it?

A. It is very uneven; it is very spasmodic.

Q. Do you mean some weeks they will take very little, and some weeks a great deal?

A. Yes, sir.

Q. Have they any facilities for taking more than they are entitled to?

A. Yes, sir; I believe so.

Q. Have not you had a law-suit with them and an examination of their flumes?

A. No, sir.

Q. Have you had their flumes examined?

A. Not that I am aware of.

Q. With that view?

A. They have no flume; they don't use it for power.

Q. Do you know the size of the opening through which the water goes?

A. No, sir.

Q. Is it the case that sometimes for a week they take no water or water to any substantial amount?

A. I don't know.

Q. Then as to Mr. Wood: is his running regularly or not?

A. His running?

Q. Yes.

A. In what way regular?

- Q. I mean to say, does he run a little while in the morning and then stop, and run again in the afternoon until night, when he stops?
 - A. I don't know. I know at times he has run every night. Q. Now, as to steam-power: you use yourself as auxiliary?

A. We do.

Q. You start an engine of 350 horse-power? A. We do.

Q. Sometimes you do that to furnish 20 horse-power? You heard the testimony of Mr. McDaniels?

A. I heard a part of it. We do it whenever we think it is

necessary.

Q. How much fuel does it take to start your engine?

A. Simply to start it?

A. I don't know that I can tell you.

Q. Not exactly, but substantially. Don't you have to put in nearly as much coal and fuel to start a fire with for 20 horse-power as if you were going to have 150 or 200 horse-power?

A. Not quite so large a difference as that.

Q. Can you tell in the morning whether you will be required to use it all day or not?

A. No, sir.

Q. You cannot?

A. No, sir.

Q. Then if you were to make up a deficiency of 20 horse-power, from 20 horse-power down to one, whatever the exigencies of the stream might require you to furnish, would not it be a fair way to estimate the cost of it at about the highest amount you have to furnish us as a regular thing?

A. That would be a safe thing to do.

Q. It would be safe, and would not you think it to be fair? A. It would not be a fair estimate of its exact cost.

Q. Can you get anything fairer than that?

A. Yes.

Q. What would be fairer?

A. An average between zero and twenty.

Q. You think that would be fairer?

A. Yes, sir; I should think so.

Q. You would require an engine of at least 50 horse-power, would not you?

A. To furnish 20?
Q. Yes, sir; to furnish it comfortably where it is auxiliary?

A. No, sir.

Q. How large an engine?

A. I should put in, if I wanted to furnish 20 horse-power as a maximum, as auxiliary, perhaps an engine of from 35 to 40 horsepower as a safety.

Q. Could you start that up any day practically without using

about as much coal as it would be necessary to use to furnish 20 horse-power?

A. Yes, sir.

Q. How do you fix that? How would you measure it? How would you know in the morning how much power you would have to use? How would you regulate your coal practically?

A. Well, sir, practically, all these mills are using steam every

day in the year.

Q. All of them?

A. Yes, sir; I think so.

Q. You don't mean steam-power?

A. I mean steam. For instance, if I was in my own mill, I have a large boiler for the purpose of furnishing steam for my dyeworks; if I was going to put in an engine to furnish myself with 20 horse-power auxiliary, I should put in another boiler, perhaps a smaller boiler possibly (well, no matter about the size); I could get up steam and start up 20 horse-power cheaper than though I had no steam on hand, because I could make use of the steam that I had on hand for other purposes to start my engine. Do you see my point?

Q. Because you would have the boilers, both of them, connected

with the engine?

A. Yes, sir.

Q. (By Mr. Storey.) The surplus steam which you did not need for your dyeing you would turn into the engine?

A. Yes, sir.

Q. (By Mr. Butler.) You have got to have it there all the time?

A. It could be done much cheaper than though I had no steam

for other purposes.

Q. (By Mr. Shattuck.) Take the Sterling mill; if they wanted to have an engine for power there, would not it be necessary to put up a new building?

A. It depends whether they have any spare room or not.

Q. Well, supposing they have no spare room?

A. Of course they would.

Q. Did you estimate that in the cost?

 $ilde{A}$. I did.

Q. Putting up a new building?

A. That would be but very little difficulty. It would cost very little, any addition to any of those mills, to put in a small engine.

[Adjourned till Friday at 9.30 A. M.]

Boston, Friday, October 13th, 1876.

The commissioners met at 9.30 o'clock.

B. W. C. FARRINGTON, recalled.

Cross-examination resumed.

Q. (By Mr. Shattuck.) What is the lowest price that you ever knew steam-power to be sold for in Lowell?

A. \$100 a horse-power, and from that up to \$125.

Q. Have you ever heard of its being sold as high as \$150 in Lowell?

A. No, sir.

Q. Where there is a mere margin to be furnished of steam-power, as auxiliary to water-power, the elements of uncertainty as to the time when it will be wanted, the quantity that will be wanted, and the necessity of having a larger engine, make it rather more expensive than it would be when it is furnished alone, do they not?

A. No, sir, I think not; I think very little would be lost. As an instance, I will say that if a man is running fifty or sixty horse-power very little would be lost by running a steam-engine of

twenty horse-power continually, if anything - very little.

Q. I don't understand what you mean.

A. Well, if a man required sixty horse-power to run his machinery, and he had forty of it constant, and at times required twenty auxiliary, it would cost very little more to run that twenty constantly than what it would cost not to run it. The expense would be but very little more.

Q. That is, it would cost very little more to run it constantly than it would to have it ready in emergencies — to run every now

and then?

A. It would not cost so much, sir. It depends somewhat upon

how often he had to start it up.

Q. So that if a man was using seventy horse-power and had fifty of it constant (what we call a constant minimum here), and then had to provide for a margin varying from twenty down, you would say that the cost of it would be represented probably by the cost of about twenty horse-power, would you not?

A. You mean the cost of the additional?

Q. You would say it would be as cheap to run the twenty horse-power all the time, if you had to furnish it reasonably often?

A. Yes, sir; I should run it constantly, for the reason (if you desire to know that) that in a steam-engine under such circumstances, if it is properly fitted up, the exhaust steam is used for heating the premises, and may also be used for heating the dyeworks and heating water, and for various purposes,—so that there is very little lost in passing the steam through the engine, as

the steam can be used after it comes through it, both for heating the premises, and also for dyeing and washing.

Re-direct.

Q. (By Mr. Butler.) That is, you would run your steam that

you used for heating and dyeing through the engine?

A. Yes, sir; and very little would be lost by running it through the engine compared with what there would be by taking it directly from the boiler. I have such an arrangement as that myself.

Mr. Shattuck. I understood the witness to say that where they had a body of water, and had to furnish a margin of steam, it

would be furnished for \$75.

Commissioner Russell. I don't think the witness has testified in regard to what he meant by that.

Mr. Butler. We will get it before we get through.

Commissioner Francis. Is there any objection to his explaining what he does mean?

The Witness. If you will give me the point that you wish

me to explain, I will make the explanation.

Mr. Butler. The point I understand is this: you said you thought that to put into Mr. Faulkner's mills twenty horse-power, would cost \$75, a horse-power per year. The point is, whether that would pay it for the constant use through the year, or whether it would be only occasionally.

The Witness. I meant that it would cost them at the rate of

\$75 for the time they used it.

Q. (By Mr. Shattuck.) You mean the steam?

A. Yes, sir; although that would admit of a little calculation, of course the interest on the cost of putting in an engine, and any necessary buildings that might be wanted for it, if they were spread over a term of twelve months, would be less than though the engine were run only two months. I don't know that a man could start up an engine and run it only two weeks in the year at the rate of only \$75 a horse-power. Probably he could not. It would depend something on the time that he used it.

Q. Did you mean when you gave that answer, that if he ran it

six months it would cost him \$37.50?

- A. If he should run it six months in the year, it would cost him in my opinion not more than \$75 a horse-power; if steam could be furnished six months in the year, or even three months, it would cost him at the rate of \$75 per year; one-fourth for three months, one-half for six months, and three-fourths for nine months. I might say that where an establishment has already boilers and coal-bins, and they are obliged to keep and do keep a fireman to look after their boilers, the expense of running a small engine is very little.
- Q. (By Mr. Storey.) What elements do you take into consideration in fixing that \$75 a horse-power?

A. I take the cost of the fuel, the cost of the fireman and

engine, — the interest on the outlay.

Q. Take a case where a person has no engine whatever, and is

called upon to furnish steam-power; how much would it cost him, for example, to put in an engine that would supply fifty horse-power, — taking into consideration the cost of the engine and boilers, the building, shafting, belting, steam-pipes, and everything that would be necessary to set that engine up, so that it would work — a fifty horse-power engine?

A. That would vary very much. If you had to furnish

buildings — if you had to build a building especially for that.

Q. Imagine such a case, where he has to build such a building especially for that. Just describe the sort of building you would put in. Give us your estimate of the cost of the engine, and then state of what elements that cost is made up?

A. I don't know that I could give you this time the cost of an engine of fifty horse-power. It would be necessary for me to go

into some figures in order to do that.

Q. How long since you had occasion to inquire into the cost of a fifty horse-power engine?

A. I never did — not that particular sized engine.

Q. Did you ever have occasion to put up an engine of that particular power?

A. No, sir.

- Q. Did you ever have occasion to find out what the cost was at all?
- A. Oh, yes, sir, because I have had occasion to put up two engines in my life.

Q. How long ago?

A. One within two years ago, a Corliss engine, and some years ago a Wright engine.

Q. You had occasion to put up the two engines now used by the

Wamesit Power Company?

A. Yes, sir.

Q. Is that the whole of your experience in putting up engines?

A. Yes, sir.

Q. Then you would not be able to give us any opinion as to the cost of engine-shafting, boilers, pipes?

A. Not at this moment. No, sir.

Q. Now as to the cost of the engine and the chimney?

- A. That would vary very much. I could give you in regard to the chimney: you might do it for \$1,000, or you might spend \$5,000.
- Q. Now then, would not the interest on the outlay necessary to put up the engine, and erect the engine be precisely the same whether the engine was run one month or twelve?

A. Yes, sir.

Q. So that element would be constant in the expense?

A. Under some circumstances, it would. In most all the mills with which I am acquainted—

Q. (Interrupting.) I am asking that question specifically.
A. I believe I answered, that it would depend upon circumstances.

Q. You mean to say that circumstances would vary the interest on the original outlay?

A. Yes, sir, very much.

Q. If you spend \$5,000 in putting up your building, and putting in your engine, do you mean that the interest on \$5,000 would differ according to circumstances?

A. No, sir; I mean to say that one man could put a twenty-five or thirty horse-power engine into his establishment at very much

less expense than another one.

Q. That is to say, if a man lived where land was cheap, it would not cost him much for that?

A. No, sir, not that.

Q. If he had room in his building where he could put an engine, it would be much less?

A. Yes, sir.
Q. The ordinary outlay and the interest on that would be the same, whether you used your engine one week or twelve months?

A. Yes, sir; I expressed that, that it would depend upon the

length of time you spread your interest over.

Q. Does an engine depreciate more when it is used, or when it

is allowed to lie perfectly still?

A. I don't know what you mean by "perfectly still." We never let an engine lie perfectly still. We move it enough to keep it in order. If it was properly cared for, I should rather have it

lie idle, if it was used enough, to keep it in order.

Q. Suppose a man was obliged to keep an engine to supply power in emergencies, which could not well be calculated in advance, and had to have his engine ready, so that if water was short to-day, and he would have to put on power, he would be able to do so, and then there would be a space of two months that he did not use it, and then two weeks when he used it constantly, would it not be necessary for him under those circumstances to keep an engineer constantly employed?

A. Yes, sir, it would, i. e., a sort of an engineer. They differ very much, engineers do. A man who was running a little engine of thirty or forty horse-power occasionally, would employ quite a different man for an engineer from what he would if he was running

a three or four hundred horse-power engine constantly.

Q. Would it require a less skilful man to run a thirty horsepower engine for part of the time, than it would a great length of time?

A. Yes, sir. I think for the small time I should find a man

who was both fireman and engineer.

Q. Of course you would run a little more risk from fire, or of accident to your engine?

A. Well, possibly so.

Q. Otherwise a man who was both fireman and engineer would do as well for twelve months as for one?

A. Oh, yes, sir.

Q. In other words, you might, if you were very economically inclined, and had a thirty or forty horse-power engine, run it constantly by the fireman, and not have any engineer at all?

A. Yes, sir.

Q. In a very large establishment —

A. [Interrupting.] I never knew a thirty horse-power engine to be used in a very large establishment. I should think, in the case of the Chase mills, they would employ a man who was both

fireman and engineer.

Q. Did I understand you to say in your answer before, that it had been no part of your business to be familiar with the water in the canal for the past two or three years, and that you had no special occasion to notice it?

A. No, sir; I did not say that, but that I had not given it so

much attention as formerly.

Q. What has been your business in the mill for the past three

or four years?

- A. I have been the treasurer of two companies, and the manager of another.
 - Q. Two companies at that dam?

A. Yes, sir.

Q. Has your office been there?

A. Yes, sir.

Q. What difference was there between the last two or three

years, and the time before that?

A. For the last two or three years I have had more care in connection with the treasurership of these companies than formerly. It has taken my attention away from the mills more than formerly.

Q. You mean that you have been more in the office, and less in

the practical management of the mills than before?

A. Yes, sir.

Q. Your main business has been about the office.

A. Well, practically, and about the mills.

Q. (By Mr. Richardson.) A question was asked you about the cost of a suitable engineer to run an engine. I did not quite

understand your answer?

A. Well, I should expect to hire a man, if I had a small engine to run twenty horse-power occasionally, and use the boilers for heating the dye-works. I should expect to hire a man certainly for \$2 a day to do both. I think I could for less.

Q. Supposing you had to furnish a little engine of fifteen horsepower, what service of an engineer would it require to run it? Could you use him for any other purpose — for attending to the fires as well as running an engine?

- A. It would cost for the fifteen horse-power engine the same for the engineer. I should not want a man in that capacity who would be obtained for less than \$2 a day; though we can hire very good men now for \$1.75 or \$1.50.
- Q. That element is one; the element of cost or capital is another; the element of depreciation is another; the fuel is another; the taxes, etc., and all those things are another. But you do not give any result. Have you had any experience of all those matters?
- A. Yes, sir; I just said that I have had experience in running steam-engines.

Q. I thought you answered that you could not give the cost of furnishing fifteen horse-power or anything approximating to it.

A. Well, I could approximate. I assume three pounds of coal

per hour.

Q. It is between two and three, is it not?

A. Yes, sir.

Q. With coal at how much?A. With coal in the vicinity of \$7.

Q. When you speak of this power at \$75 a horse-power, you mean for how many hours in the day?

A. For ten hours.

Q. While they ran 11½ hours, it would be a proportional addition, would it not?

A. No; not proportionally.

Q. You have testified that they could get power at \$75. Now, if you mean that that would be for ten hours, the cost would be more for 11½ hours, would it not?

A. The cost would be a little more, but not proportionally.

Q. Do you know of any power that is sold to be used for 1114 hours per day?

A. I don't know of any to-day; for they don't work even ten

Q. Now, when you speak of this price that it has been sold for there, you know that it has been sold higher, do you not?

A. I never heard of it.

Q. Don't you know what Mr. Hiscox paid for this very company?

A. I don't know.

Q. Don't you know what Mr. Hiscox paid during the five years' term, for what he had from the Wamesit Power Company?

A. I don't know exactly what he paid.

Q. You have spoken of what power has been let for by the Wamesit Company?

A. Yes, sir.

Q. Now, don't you know the fact that on the five years' term of time, it was let for \$100 a horse-power?

A. No, sir; it never was.

Q. You knew of the contract-lease with Mr. Hiscox, didn't you? A. I did.

Q. What was the amount he paid for what he used under that contract?

A. \$75 per horse-power.

Q. Then what else made up the \$100?

A. Rent of buildings and land.

Q. He didn't have a building, did he?

A. Yes, sir; he had a place where he had some grinding.

Q. How much land did he have in area?

A. Well, I should say, possibly, twice as large as this room.

Q. And how much of a building?

A. The building that stood upon that land belonged to himself.

Q. Then he didn't pay for it to you?

A. Yes, sir; he had another.

Q. He paid that \$100, and paid it in one sum, did he?

A. Yes, sir.

Q. You divide it into \$75 for the horse-power and \$25 for the land?

A. Yes, sir.

Q. Now do you mean that it was land twice as large as this room?

A. All in excess of \$75 was paid for land.

Q. (By Mr. Shattuck.) That was \$25 a horse-power?

A. He had another building in another part of the works, — a small building used for another purpose.

Q. He testified distinctly that he paid that for the land and

power, he putting up the building.

- A. He had another small place at another part of the works.
- Q. Was it a brick building?

A. I think it was stone. Q. How large was it?

A. Well, it was a small place.

Q. About how large?

A. Well, it might have been, I should say, about twenty feet square.

Q. What was it used for? Was there any power in that?

A. Yes, sir.

Q. Any power used there?

A. Yes, sir.

Q. He used part of this power?

A. Yes, sir. Q. How much?

A. Well, I don't recollect. I think, though, that it was one horse-power. It might have been two. It was a small amount that was used there.

Q. So that he put his own building on what land he had?

A. Yes, sir. Q. And flume?

A. No, sir; there was no flume on it. He took the power from

another building.

Q. And for what he had, you divide it, that \$75 was for the horse-power, and the balance would be for the land and what else he had there?

A. Yes, sir; he used some water.

Q. (By Mr. Storer.) You say steam-power could be furnished for \$75 a year. Does it make any difference whether you furnish ten horse-power or one hundred, in regard to the rate?

A. I should think the rate of cost for ten horse-power would be

a little more than for a larger amount.

Q. How would you vary it? How much would it cost per

horse-power for three hundred?

A. Well, I don't know the exact proportion between a small amount and a very large amount. I can give no approximation.

Q. Can you give not even a guess?A. I don't know but I could guess.

Q. So between ten and three hundred horse-power you could

not say how much the difference would be in the rate of cost for furnishing?

A. No, sir.

Q. Then if you had not in your mind any special amount of horse-power when you fixed the price at \$75, will you say how you happened to take \$75 as the price?

A. I did have something in my mind.

- Q. Please state what number of horse-power you had in your mind?
- A. Our conversation was based upon the consideration that twenty horse-power would be used, and that it might be thirty-five or forty, in an engine of that size.

Q. On what data was that opinion based?
A. The cost of coal, the cost of a fireman.

Q. What price do you fix for the coal?

A. I counted the cost of the coal at about \$630 a year.

Q. At what price per ton?

A. Seven dollars.

Q. What is the price at which it can be delivered at Lowell to-day?

A. It can be delivered at Lowell for less than that.

Q. That is \$630 a year at \$7 per ton. What is the cost of the

engine?

A. I arrived at it in this way: I said that that would leave \$870 to pay for the firemen, interest and depreciation, which I knew was very large; that it would fully cover it.

Q. Now, I want to get at whether you fixed \$75 a horse-power

first, and then worked up your items, or vice versa.

A. I took the items first.

Q. Now, how much did you figure for engineer, how much for fireman, how much for depreciation, how much for interest, how much for taxes, and how much for cost?

A. I did not put all the items separately in that way.

Q Then how did you happen to arrive at \$870?

A. I told you. I allowed \$630 for the coal at three pounds per hour per horse-power.

Q. You started with your coal as constant. Now, how did you

get your \$870?

A. I accounted that engineer and fireman would cost very little more for either of those estimates than to run without them.

Q. Then you had in your mind what estimates?

A. I was asked to take the Sterling mill, and how much I could put in twenty horse-power for.

Q. You don't allow anything for fireman and engineer.

- A. I do, but not much. I don't think it would cost a dollar more.
- Q. You had in your mind certain figures on which you based your estimates. I want to get at what those figures are. Now, you say you did not allow any definite amount for engineer or fireman.
- A. Not any definite amount, but I did allow something. It would be a large allowance if you allowed one-quarter of the pay of a fireman.

Q. You said that under certain circumstances it would cost \$75 a horse-power.

A. It would not cost over that.

Q. You tell me that that \$75 is reached by adding together certain items, and you tell me that one of those items is so much for coal. Now, I ask you to give me what items were in your mind when you fixed that price?

A. I will tell you. In the first place, there was the coal, then

the engineer and fireman, which would be very small.

Q. (Interrupting.) Now, you say that you allow for engineer and fireman very little. Now, I ask you how much? That is a simple question.

A. I would not allow over twenty-five per cent of his pay.

Q. How much in dollars and cents?

A. That would depend upon how much you paid him. Q. How much did you allow when you fixed it at \$75?

A. I did not figure it in that way.

Q. How much did you allow for interest?A. I did not figure the amount of interest.

Q. How much for depreciation?

A. I told you that I did not figure it in that way.

Q. Then I should be glad to know how you did get at it.

A. I assumed that I knew pretty much what the coal would cost, - \$630. I assumed that fireman and engineer would cost very little more; probably the actual fact would be that it would be nothing more. It is possible that in addition to the fireman, the services of a machinist or mechanic might be occasionally called in for repairs. That would be very small. Then I said that the cost of extra coal-bins, and a boiler, possibly, and the cost of a room, which in most cases in the mills on that stream would not be called for at all. There is probably not a mill on the stream that has not room enough to put an engine in without extra inconvenience. I put that down at a certain sum. Then I deducted from that what the value of the steam would be worth after it had passed through that engine. In my figuring I could not bring it up to \$60. But I assumed, with all the breakages and inconveniences, that it was perfectly safe to say that it could be furnished for the \$75. I did not think it would bring it up to \$50.

Q. You had 20 horse-power?

A. Yes, sir.

Q. Didn't you take 20 and multiply it by the 75, which makes 1,500: and then you found the coal would cost \$630, and you said that therefore \$870 would be the cost of the other items?

A. No, sir; I did not do it in that way.

Q. It is curious, then, that that is the way it works out.

- A. No, sir; I did not do it in that way. I say I don't think it would cost \$870.
- Q. You say you think it would consist mainly of those other things?

A. Yes, sir; I say so now.

Q. Did you get at that \$870 by subtracting the cost of the coal from \$1,500, or did you get at it independently?

A. I arrived at it independently.

Q. Now, I should like to know what items in your amount would figure up \$870?

A. I did not have any.

Q. Then how did you get the sum?

- A. I tell you it did not amount to \$870. I said it did not amount to \$60 a horse-power in my figures, but I put it at \$75 to cover all possible chance of loss or depreciation or breakage.
- Q. Then you are not testifying about the cost of furnishing steam-power in general, but as to what it would cost to put steam into two or three particular mills in the most economical way?

A. Along there.

Q. (By Mr. Shattuck.) Mr. Farrington, in the first place, did you ever know an engine to run on an uncertainty with only using twenty horse-power, to get steam for three pounds of coal per hour?

A. I never knew of an engine running on an uncertainty.

Q. Running as it does in the Stott mill, for instance, to get power for three pounds of coal per hour?

A. I don't know how it runs in the Stott mill.

Q. As they must run where they are running in this way?A. If you want my opinion upon, that I can give it.

Q. I should like to know the facts.

- A. In the way you put the question, I don't know anything about it.
- Q. Do you know anything about an engine of 20 horse-power furnished with coal as it runs, for three pounds of coal per hour?

A. I don't know any particular engine of that kind, but I be-

lieve it can be done inside of that.

Q. Practically, you don't know of any that does furnish it at that rate?

A. I don't know of any particular engine that furnishes it.

Q. Generally, do you know of any engine that furnishes 20 horse-power at the rate of three pounds of coal an hour per horse-power?

A. No, sir.

Q. Then how do you get at your three pounds?

A. I get at it by the quantity of coal I have used in my own engine, which is a Wright engine.

Q. What other engine have you?

A. A Corliss engine of 350 horse-power.

Q. How much coal do you use there per horse-power?A. I don't know so much about that as about the other.

Q. Do you know about the Wright engine?

A. Yes, sir.

Q. How much there?

A. It is varied; sometimes less than three, and sometimes more than three.

Q. How much more than three?

A. Sometimes I have seen the time when it has used more than four.

Q. You propose to squeeze us down to the lowest point, — more

than you have ever run yourself?

A. I will tell you why it used four. At one time we were not prepared to heat the water, and we pumped the cold water into it. At another time we were furnished with a heater which very much diminished the quantity of coal. The heater was a boiler for heating the water before it went into the steam boiler.

Q. So that you have two furnaces or places for heating?

A. No, sir.

Q. Then, how much power does that engine furnish?

A. I think we have taken one hundred and fifty horse-power.

Q. At that you sometimes get four, and have run at less than

three?

- A. Yes, sir.
- Q. How much less than three? Have you ever measured?

A. We have at times run at two and three-quarters.

Q. When you are running your engine so, does it not take more coal?

A. It practically might take more.

Q. Do you believe there is any engine in Lowell, furnishing twenty horse-power, which is run at less than five pounds of coal per hour?

A. I don't know how they are fitted. I never examined one.

Q. So you propose to put us in on three pounds, without any fuurther knowledge than that an engine of 150 horse-power has been squeezed down to more than four?

A. I propose to put it at three pounds with what knowledge of

steam I have.

Q. That will do for the coal. Now, how much less power do you get out of your steam where you use it for heating than where you do not? How much less pressure?

A. It is very little.

Q. Did you make any allowance for that?

A. Oh, yes, sir. There is about two pounds less pressure. Q. Is there not fifteen or sixteen pounds less pressure?

A. Oh, no, sir.

Q. Are you sure? A. Yes, sir.

Q. Don't it come down one-third?

A. No, sir.

Q. How do you know that?A. Because I have measured it.

Q. Sometimes they use the same steam for heating that they use for power in mills; at other times they do not. It is not settled that one way is better than another, is it?

A. Yes, sir; I think it is decidedly settled.

Q. There are some inconveniences attending it?
A. Well, if you are properly fitted up for it, I don't know that there are any great inconveniences.

Q. It reduces your power somewhat?

A. Not but very little. There is a slight back-pressure.

Q. One other question. Your place is at the lower end of the canal, is it not?

A. Yes, sir.

- Q. How often did you have occasion to go to the head of the canal to observe the water on the dam?
- A. Sometimes every day, sometimes twice a day; sometimes every week, and sometimes once a fortnight.

Q. Your observations for the last three years you do not testify

to, but only prior to that time?

A. I did not say that, —but that I had not given so much attention for the last three years as formerly. Formerly I gave it my constant attention. During the last three years my attention has been somewhat withdrawn to other business. When I have been at home, I have always seen it every day.

Re-direct.

Q. (By Mr. Butler.) A question or two, Mr. Farrington: Take a woollen-mill that is running from six to fourteen sets of cards, such as several mills are up and down our canal; whether they must not always have a steam boiler for heating and dyeing purposes?

A. I should think they would be indispensable.

Mr. Richardson. He has had no experience in manufacturing, and the necessities of it.

Q. How long have you run a woollen-mill?

Mr. RICHARDSON. No, I mean a mill of that kind.

Q. That involves the necessity of a chimney being built to make steam, and boilers being set, does it not?

A. It does.

Q. Coal bins and appliances for taking care of the coal?

A. Yes, sir.

Q. There must be a fireman to give constant attention to that boiler for heating and firing purposes?

A. Yes, sir.

Q. And the steam must be running that boiler under a certain pressure, more or less?

A. Yes, sir.

Q. Now, having those appurtenances, all you want more to run a twenty horse-power engine is a place to set the engine and to make the connection in the mill?

A. Yes, sir.

Q. Is there anything objectionable in putting a small engine into the basement room of either one of those mills?

A. I don't know of any.
Q. Then, having the steam already up for heating purposes, what is necessary to be added if you run the engine in addition, is either to put a sufficient pressure on your boiler, or, if more is required, to put in a boiler?

A. Yes, sir.

Q. And the same fireman, if he is a competent man, can run that engine who tends the boiler, can be not?

A. I should say he could, decidedly.

Q. And he does do it practically in your concern?

A. Yes, sir.

Q. And that with a 125 horse-power engine?

A. Yes, sir.

Q. And then your method of using would be to run the steam through your engine to get the power of the increased pressure, and then use it for heating and dyeing upon the back pressure?

A. Yes, sir, and the exhaust.

Q. You use the exhaust for heating and drying?

A. Yes, sir.

Q. And that is the way you have practically run your own engine, is it not?

A. Yes, sir.

Q. And running in that way, with proper fixing up, you found you could make a horse-power for a about $2\frac{3}{4}$ pounds of coal.

- I object to that form of interrogatory. It is Mr. Storey. testimony coming quite as much from the counsel as from the witness.
- Q. Now then, do know of an engine in a large mill in Lowell the Lowell Carpet Works — which is running that way?

A. I do.

Q. From your knowledge, is that a common and economical way of using steam?

A. I think it is — decidedly an economical one.

Q. And with such use of steam you could have it all ready to supplement your water-power, as it goes up and down?

A. Yes, sir.

Q. Practically, in the operation of steam, whether it is not quite as economical to make your steam in an excess of boiler capacity rather than to have less or little boiler capacity?

A. I always have an excess of boiler room.

Q. For making steam for any purpose, it is more economical?

A. Yes, sir.

Q. Now, would not it be, in your judgment, as a man used to using steam, a proper and economical way, if you wanted a twenty horse-power engine, to put it in a separate building—under circumstances of wanting twenty horse-power from an engine --- in connection with the several mills on our stream? Would it be proper to build a separate building and put the engine outside of the mill make separate and distinct arrangements for running that engine and heating it up whenever it was wanted to run, letting the boilers be cold all the time, and then put in the coal and heat it up as it was wanted?

A. I should not do it.

- Q. When you spoke of steam-power being sold at \$125 a horsepower, whether that was in the centre of the business streets in Lowell — at small amounts?
- A. I never heard of but one instance in Lowell where it was so high as that. I have heard that as high as that had been charged at the Lowell Hosiery Mills. I have heard that power had been sold there at \$125.

Q. In small amounts?

A. Yes, sir.

Q. Is that the only instance?

A. Yes, sir.

- Q. Do you mean to say that in a mill running ten sets of cards and the requisite machinery, requiring twenty additional horsepower, having the necessary appliances to heat the mill, and steam the dye and scouring works, and for drying, it would cost \$75 a horse-power to put in an engine and run the steam through that engine, and so get the power? That it would cost as much as that?
 - A. I don't think it would cost as much as that.

Q. What would you put that cost at?

A. I don't know as I quite understand you.

Q. I will repeat the question: A mill has ten sets of cards, with all the requisite machinery, steam heaters, steam dryers, and steam dye-works; it has its boiler, coal-bins and chimneys, and all appliances for making steam for that purpose; it has occasion to use for a part or whole of the year, as the case may be, twenty horsepower of steam. Now, to put in an engine and to use that steam to make twenty horse-power, with those appliances to start with, would it cost \$75 a horse-power to make that twenty horse-power of steam?

A. I don't think it would.

Q. How high should you put that cost under such circumstances as I have stated? Give a liberal estimate of how much it would cost to produce twenty horse-power.

A. I am quite sure that \$60 would do it, and I have heard of its being done very much less. I think \$60 would be a very

liberal calculation.

Q. You have heard of its being done for very much less?

A. Yes, sir; I have.

Q. Now, Mr. Farrington, suppose you had occasion to use twenty horse-power under the circumstances that I indicated in my last question, and had an engine in and the main power up, and we will say that fifty horse-power was variable, whether you would think it economical to run your engine the whole time?

A. Well, it has always been my belief that the engine could be run the whole time nearly if not quite as economically as it could

be run spasmodically or occasionally.

Q. Is one element of that belief the fact of the little increased cost in the steam in running it through the engine?

A. That is one of them. Q. What is the other?

A. The power would be steady and regular.

Q. The power would be better? A. Yes, sir; more uniform.

Q. So that, if you had a power which for three months in the year — those months composed of different days when your power would run down from seventy horse-power to fifty or sixty, as the case might be, for a portion of the day, and you would require steam either part or the whole day to supply that twenty horsepower for three months in the year — would you think it a good custom to run that engine the whole time, looking to the quality of

the power you got at your works?

A. My impressions are, that I should. I never tried; but I have studied it and thought of it a good deal. It has been my belief that it would be a saving rather than otherwise to run the engine constantly and keep it running.

Q. One other thing: a competent engineer must be a competent

machinist, must he not?

A. Yes, sir, he should be.

Q. And when the engine is not necessary to be run, there would always be work for him in the machine and repair shop, would there not?

A. That is the way I employ one.

Q. So that if one concluded to run his engine only part of the time, there would be no loss from the time when the engineer was not running the engine—no loss of his wages?

A. No, sir.

Cross-examination resumed.

Q. (By Mr. Richardson.) Your answer of \$60, embraces the same exceptions as to cost, which I think you left not very clear, as to how it can be applied. I want you to say what that \$60 covers. Now, what is there that that does not cover, that was assumed in Mr. Butler's question? He assumes certain conditions, and then he says, "with those conditions assumed, what do you think a horse-power would cost?" and your answer was "\$60"?

A. No, sir; I said it would not exceed \$60.

Q. Now I want to know what you take out of the cost, in answering that question?

A. He has the appurtenances already existing.

Q. Such as what?

A. Such as chimney, boiler-house, coal-bin, fireman; and, as generally the establishment is fitted up, there is the boiler-room. Generally they have an excess of boiler-room.

Q. You don't put in the engineer there?

A. I should not have an engineer. I should make the fireman

run the engine.

Q. I wanted to get that distinctly — what the difference was. You say, that having those things all paid for, and reckoning nothing for them, you could do the balance for \$60?

A. Yes, sir.

Q. And you could dispense with an engineer?

A. Yes, sir.

Q. Now, if you added an engineer, it would add \$600 per year?

A. It would depend upon the class of engineer.

- Q. You would not want less than a \$2 man, I suppose?
 A. I think not. You can hire a very good man for \$1.75.
 Q. That would add \$30 to your horse-power, would it not?
- A. If you employed an engineer all the time at \$2 a day, it would be \$600. It is a thing I should not do.

Mr. Butler. You might have a superintendant at \$3,000 a year.

Q. If you had a twenty horse-power engine in one of those mills, you would have a fireman competent to take care of it?

A. I should.

Q. I understood you differently before.

- A. To run a twenty horse-power engine, I should make one man do the whole.
- Q. Now, you said you saw no objection to putting an engine into any of those mills. Would it not be an objection in Mr. Faulkner's mill?
 - A. It would depend upon what kind of work was being done.

Q. Take the finishing work?

- A. No, sir; in certain kinds of finishing it would not interfere with it at all.
- Q. I mean to the help. Would it not be an objection to have a steam-engine in the same room where help were employed?

A. I do not see any objection whatever.

Q. Is there not a great deal of heat, making it very uncomfortable?

A. That would depend upon how near it was.

Q. Don't you know of them where they are in the same room?

A. Oh, yes, sir.

Q. You would not consider that an objection?

A. No, sir; it certainly would not be in winter.
Q. (By Mr. Storey.) Does it cost any more for coal in a

small engine than in a large one?

A. I should presume it might, if you were running a small engine alone; but if you were running it in connection with other works, as making steam for dyeing and heating, I am not certain that it would.

Q. I mean, to make the conditions the same?

A. If you were going to put up an engine separately, outside, and had nothing else to do with it but to furnish power, I should suppose it would cost more.

Q. Making the conditions the same for a large engine and a small one, does it take more coal per horse-power to run the small engine than it does the large one?

A. It would depend upon what the conditions were.

- Q. Supposing that you are doing nothing but running an engine?
 - A. I should suppose it would cost more to run a small one.

Q. Do you know in what proportion?

A. No, sir.

Q. Was your statement about the number of pounds drawn from your experience with the engines you run in your mill?

A. Yes, sir.

Re-direct.

Q. (By Mr. BUTLER.) The "Corliss" is thought to be the best engine, is it not?

A. It is as good as any. I think it is the best.

Q. (By Commissioner Stevens.) What is the exhaust steam-pressure on your engine? How much does it vary from the direct?

A. Well, it is between two and four pounds, as nearly as I can

get it.

CLEMENS HERSCHEL, sworn.

Q. (By Mr. Butler.). What is your business?

A. Civil engineer.

Q. Whether you have given attention to hydraulic engineering?

A. Yes, sir.

Q. How many years have you been in the business?

A. I have been in the business eighteen years.

- Q. You were employed at Lowell at one time on the locks and canal works?
- A. I have several times been there for periods varying from a couple of months to a couple of weeks.

Q. You studied your profession for some time in Germany,

didn't you?

- A. Yes, sir; I graduated at the Scientific School in Cambridge, and studied for three years in Germany and for six months in France.
- Q. You are now in the employ, and have been for some time, of the City of Boston?

A. Yes, sir.

Q. (By Mr. Shattuck.) In this matter, you mean?

A. Yes, sir.

Q. (By Mr. Butler.) Whether at any time you were employed to make estimates and plans for the widening of the canal at the Wamesit dam at Lowell?

A. Yes, sir, I have.

Q. When was it?

A. I find that I made the plans in 1869.

- Q. When was the work begun under them?

 A. Well, I have not looked up my notes sufficiently to be absolutely positive; but I think it was about the same time.
 - Q. And the work continued for upwards of two seasons, didn't it?

A. I believe it did.

Q. Have you the plan of the sections of the canal?

A. I haven't them here, — not the cross sections.

Q. Didn't you have them here yesterday or the day before?

A. No, sir; I had the results.

Q. What amount of water was that canal, according to your plans, to be widened and deepened, so as to carry when the water was at the top of the stone dam?

Mr. Shattuck. What is your question?

Mr. BUTLER. This gentleman made the plan by which we did the work, and it has already been proved by both Mr. Farrington and another witness that he did widen and deepen it.

Mr. Storey. I understand the question to be, "How much was

it intended to widen it?"

Mr. Butler. Yes, sir, — how much he made the plans to widen and deepen it?

Mr. Storey. It might be objectionable in one sense. It de-

pends upon what it is followed up by.

Mr. Butler. We cannot show both the plan, and the work at the same time.

Mr. Storey. You can say whether you expect to show both.

Mr. Butler. I am going to show the plan and then put in the work afterwards.

Mr. Shattuck. If they are going to show how much they have widened according to those plans, and do show it, then I shall not object.

Mr. Butler. I think I can help you a little with this business.

Mr. Shattuck. The question is whether your evidence is legally admissible; and we object to it unless you propose to show as I stated.

Commissioner Russell. The question is objected to.

Mr. Shattuck. Until he states that he expects to show that it was widened according to those plans. I shall object to the plans

going in unless he does.

Mr. Butler. I propose to show first that the gentleman was called upon to make the plans and estimates for widening the canal. He was then called upon to superintend the making of plans for the contractor to widen it,—as superintendent of the work. The contractor went on until he failed, and then we finished it by the day's work.

Mr. Shattuck. Was it according to these plans?

Mr. BUTLER. We had no others. If they did not finish it according to the plans, they made a mistake.

Mr. Storey. The value of the evidence would be one thing,

and the competency of it another.

Commissioner Russell. The fact that the witness made the plans for the widening, has no value unless it is followed by evidence that the plans were adopted. I understand that to be the offer that General Butler makes.

Mr. Shattuck. If he will say that directly, then I will with-

draw my objection.

Mr. Storer. I understand the offer to be this:—That Mr. Herschel made certain plans, and that a contract was made to widen the canal in accordance with those plans, and afterwards the contractor went on and did some work and then failed, and thereupon they went on and finished the work according to the plans. Now, a contractor may undertake to work according to plans, and may fail to work according to those plans. If they propose to show that that canal was actually widened and deepened in a certain way, and that those plans represent it, that is one thing. It is all open for them perhaps to show that an attempt was made to carry them out, but that is another thing.

Commissioner Russell. If the plans were not carried out they

go for nothing.

Mr. Butler. It will not hurt you any if we never struck a blow.

Mr. Richardson. Does the plan aid at all, — if proven? It is what was done; that is a fact that must be proved independently. The fact that the plan was made does not at all tend to prove what was done.

Mr. Butler. If we should show that we worked there, it would be possible to show how much we did do without the plan.

Commissioner Russell. I understand Gen. Butler to say that

he worked according to the plan.

Mr. Storer. The evidence introduced yesterday that it was widened and deepened was certainly not evidence that it was according to any plan.

Mr. BUTLER. We made a plan. Men generally do a thing

according to some plan or system.

Mr. Storey. I have known a great many such cases where

plans were not made.

Commissioner Russell. He offers to prove that the caual was widened and deepened according to a plan, such as was made. If that is not so, the evidence should be stricken out.

Mr. Storey. Do I understand that Gen. Butler proposes to show that the canal was widened and deepened according to the

plans?

Commissioner Russell. I understand that he does. If that is a misunderstanding, I should say that the evidence given in

regard to the plans should be stricken out.

Mr. Butler. I don't know whether it was done according to the plans. I know he expected to have it done according to the plans. I want to be perfectly fair. I cannot say that they succeeded. We began, and worked awhile exactly according to the plans, and quarrelled with our contractor because we thought he slighted the work.

Mr. Storey. If he can say that it was widened and deepened

according to the plan, it is competent.

Mr. Shattuck. As I understand the statement of Gen. Butler, he does not say that it was widened according to that plan. The inference from his language is that it was not.

Commissioner Russell. We will go on, gentlemen, and see

what it was.

Mr. BUTLER. I must depend upon the evidence.

Q. Did you make plans for that work, taking the water at a certain height?

A. I designed the canal to carry —

Q. (By Mr. Shattuck.) [Interrupting.] That is not an answer. Did you go on and design a plan?

A. I did.

Q. (By Mr. Butler.) Now, a plan of what capacity of canal did you make?

Q. (By Mr. Storey.) Is the plan here?

A. I have said that it was not.

Q. (By Mr. Butler.) Have you got the notes from which you made the drawing?

A. I have here the capacity that I designed the canal to carry, and I staked it out on the ground.

Q. You staked it off on the ground?

A. I would say that the plans I have would not throw a particle of light on the question.

Mr. Storey. The best evidence to prove that, is the plan itself. Mr. Shattuck. It is very important, because we may want to contradict it, and show that it was not in accordance with it.

Commissioner Russell. If the plan is within the control of

the witness it must be produced, I think.

Mr. Butler. Exactly. I have asked him to produce it. I was prevented from going on by this *abattis* of objections.

Mr. Shattuck. When you go on regularly there will be no

abattis.

The Witness. I cannot produce the plans that we worked from at that time. I have certain cross sections of it. I cannot produce all the plans that we worked from eight years ago. They passed from my hands, and perhaps they are in the possession of the Wamesit Power Company. I have a few cross sections only. I have my letter-press copy of the contract, and I have exactly the capacity of that canal, under certain conditions. That is exactly what I have stated.

Q. (By Mr. Butler.) You said you were called upon to make a plan of some widening and deepening of the canal. According to your plan and estimate for the widening and deepening of the

canal, what amount of water was it to carry?

Mr. Storey. That we object to.

Mr. Shattuck. We make no objection to his stating that if the canal were of a certain width and depth it would carry a certain amount of water; but the fact that he made certain plans, contracts, and things of that sort, which he does not produce, is of no consequence whatever. It is obvious that the only question here is, how much width and how much depth will carry a certain amount of water?

Commissioner Russell. That appears by the plans, if in existence; and the question what the capacity is resulting from that width and depth, with a given height of water, he can answer.

Q. Well, sir, I will put that question. Give the width and

depth to which you made it, as near as you can?

Mr. Shattuck. That is not the question, — the width and depth to which he made it, — but what width and depth would carry that amount of water. That we do not object to, but we object to their giving the impression that something has been done which was not done.

Mr. Butler. I will ask the commissioners to rule upon my question. I will repeat it. To go back to the beginning: as a skilled engineer, were you called upon to make a plan, and did you make a plan, estimates and measurements to widen and deepen the Wamesit Canal to carry a certain amount of water?

A. Yes, sir.

- Q. You did?
- A. I did.

Q. After you made the plans and estimates, did you stake out and give levels and widths for the construction of the canal?

A. I did.

Q. After you had done that, were you employed to make a contract with the contractor to do the work?

A. I did that.

Q. Have you that contract, or a letter-press copy of it?

A. I have a letter-press copy of it.

Q. Was any work done according to that contract?

A. There was.

Q. Did you superintend that work?

A. Yes, sir.

Q. Where did the work begin?

- A. That work began, I think, around Faulkner's mill, and up stream from there.
- Q. It began at Faulkner's mill, and up through the canal to the dam?

A. Towards the head of it.

Q. At the same time did you make the proper drawings and plans for head-gates?

A. No, sir. I did not make those.

Q. Were new head-gates put in about that time?

- A. They were put in after that time. I was not then there.
- Q. How far was the work done on that canal under your supervision?
- A. Well, I was there after the contractor left, and superintended the taking out of the rock section opposite the Bolt Company. That was under another contract.

Q. Were those rock sections taken out according to your plans

and directions?

A. That one opposite the Bolt Company, I think, was. That is my recollection. That was finished according to my directions.

Q. State whether the canal required widening and deepening

through its whole length, or only in certain places?

A. Through its whole length, at least as far as the flumes under the buildings of the Wamesit Power Company. When I say the whole length I don't want to be understood as meaning clear up to the Bleachery, but only just by the Belvidere.

Q. Down as far as the Belvidere mills?

A. Yes, sir, and a little further.

Q. Now, will you state how much was the estimated capacity of

that canal according to your plan?

Mr. Storey. I object. I conceive that the question before the commissioners is just this: how much water will that canal carry?

Mr. Butler. Yes, sir.

Mr. Storex. It is competent for the defendant either to prove by this witness that the canal is so wide and deep, in figures, to his personal knowledge, or as an expert he can say if it is so wide and so deep, it will, in a certain stage of water, carry so much water, and that is all. If he can say that the canal is so wide in feet and in inches, and so deep in feet and in inches, and a canal so wide and so deep will, if the water is at a certain height on the dam, carry so many cubic feet per second, that is competent testimony; or, if he can assume a given case, and say that a canal of such capacity, of such size, of such head of water, will carry such an amount of water, that is a competent question to put to him. The question is not what the capacity was according to certain plans, but what the actual capacity of the canal is to-day.

Mr. Butler. And as tending to show that, I want to show what was done, and by and by I will suggest another method of getting at it which you have not mentioned; to wit, he has measured it.

Mr. Storey. That I shall not object to when it is offered.

Commissioner Russell. As I have already ruled, I consider that his plan is immaterial, unless followed by testimony that the plan was executed, and material and admissible if it is followed by such testimony.

Q. As far as the contractor went, whether or not it was executed according to your plan?

A. Yes, sir; it was.
Q. Then there was a second contract made, was there not?

A. There was for that rock section opposite the Bolt Company.

Q. And that was carried out according to your plan?

A. That was carried out according to my plan, I am pretty positive.

Q. Then, whether or not the remainder was executed by days'

works, whatever was done?

A. That was done by days' labor. Mr. Farrington superintended that. That was all the rest of the first contract.

Q. Now, sir, in your judgment as an expert, what would that canal carry as far as it was done according to your contract, with the water at the top of the stone dam?

A. If done according to my contract —

Commissioner Russell. Not "if done according to your contract;" that is not the question. Your question, Gen. Butler, as you put it, was, "as far as done according to your contract."

Q. The question is how much would be the capacity of the

canal up as far as it was done according to your contract?

Mr. Shattuck. I do not understand the meaning of that question.

Mr. Butler. I do not see any difficulty in my question. A canal consists of different sections, I suppose, different portions; and I think I am at liberty to prove that the point between the dam and Faulkner's was done according to the contract; and I am now giving evidence tending to show that. Now, as an expert, I ask him how much that canal was widened in the part done according to the contract.

Commissioner Russell. As it was actually done?

Mr. SHATTUCK. That may have no significance; because, if there was a part smaller above, the water could not get into it.

Commissioner Russell. If this witness knows the dimensions of that canal as they are, and can give the measurements, I do not see any reason why the direct question cannot be put, how much the canal is competent to carry as it is now. There may be some reason which I do not know, why that question is not put, but I must rule upon questions as put. The question now is, as

the canal was constructed, what was its capacity? I suppose that is admissible.

A. I don't know; I cannot answer any such question as that, because I don't know what was above or below it. It was widened according to my contract, to my absolute knowledge, in the rock cut opposite the Bolt Company, and it was partly widened according to my contract along the rest of the canal; and about that time the contractor failed, and just at that point, as I understand the question to be, it is what the canal carried then, just at that stage of the proceedings. That question I cannot answer.

Q. Now, then, what was the estimated amount that the canal

would carry?

Mr. STOREY. To that I object.

Mr. Butler. What a canal of a certain width would carry? Mr. Storey. There we come into the region of speculation.

Commissioner Russell. The question is admitted, subject to the qualification that it is to be followed by proof that it was so constructed.

Q. I am now upon the question how much water a canal of the

width of which you made an estimate would carry?

Mr. Shattuck. To that I object. I do not see any reason for these preliminary questions. He asks what the capacity of the canal which he estimated was.

Commissioner Russell. That I rule to be admissible upon the supposition that it is to be followed by proof of what the estimate was as to dimensions, and that they constructed the canal accord-

ing to it.

Mr. Shattuck. The reason why preliminary questions are admitted in this way, is because it is not reasonably practicable to put the whole question in a proper form; but in a case of this kind, it seems to me there is no excuse for admitting any such preliminary question. If he says he is going to show it, let him incorporate it in the question, and then we have something definite and something instructive; but as it is, we have spent twenty or twenty-five minutes, and it comes to nothing. We stand just

where we did in the beginning.

Mr. Butler. I suppose we do not leave all our common-sense when we get into the trial of a case. Here is a company owning a canal, and they undertake an outlay to widen and deepen it. These mill-owners have no claim upon the company to widen, or deepen, or alter it, upon any deeds put in. That was a personal covenant of Mr. Whipple, which died with him. If there was any covenant, they evidently did it for the purpose of getting water down to their mill, which was on the lower end of the canal. Now, it becomes convenient for a third party to prove something about the capacity of the canal If a canal is to be made successfully, there must be an estimate, then a contract, or work by the day, and then it is to be finished as well as it may be. Now, it becomes necessary, after a lapse of seven years, to prove about that, and it will become still more difficult seven years hence, or ten, or fifteen, if it ever comes up, and we have to approximate. You do not know the reason, perhaps, why I put the question. You do

not know who is dead, who the living witnesses are, what the troubles are. I must proceed as well as I can; and the first thing I want to prove, and I think it is competent even if I should stop there, is, that there was a contract entered into to make a canal that would carry so many feet of water, and it would be competent upon two grounds. It would be an act done by a party against his interest. If there was no water there, owning the land, and, in common with those other parties, owning the water, it would be against his interest, if there was only two hundred feet, to go on and deliberately make a canal that would carry four hundred feet, for he would be at a foolish expenditure. It would be like laying down a four-inch pipe to carry one inch of water. It was the act of the party then owning this water, and I put it in in answer to the claim which is made here that nobody ever supposed that there was more than 225 cubic feet of water. It would be competent in that view; but, without pressing that, I call your attention to what men are likely to do. I ask, first, what amount of water would the canal, according to your estimate, carry? That is to be followed by the question, what was your estimate of the width and depth of that canal necessary to carry that amount of water? Leaving it there, I think it would be competent, because I put it then in the power of my adversary to go and see, for the canal is there in existence. The rocks have not gone, and they can go there and measure, if they are not satisfied with the proof. Then I show that a contract was made, the work went on, and the contractor failed. Then another contract was made for another section, and carried out exactly according to that plan, and I should argue to reasonable, sensible men, that the canal would not be cleaned out between Faulkner's and the dam, and then, the contractor failing, the party would not be likely to come down here and cut out a rock section (which was very dear cutting) according to the width of the canal, and leave it closed up between. I think that would be some evidence tending to show that it was done. It would convince me that, if the men who had the matter in charge were not fools or lawyers, they would have acted differently from that.

Mr. Storey. The gentleman has stated the whole case precisely

as I supposed it was.

Commissioner Russell. I will not trouble you, Mr. Storey. If that is all that is to be proved, I think the evidence is inadmissible. I do not think we are to go upon probabilities as to what parties did in the construction of a certain portion of this canal, because it is perfectly plain that there is better evidence than probabilities as to what they did. It is susceptible of proof, and the proof is in their hands. The best evidence of what a canal is, is by obtaining proof as to what it is, and not by proving what the probability is as to what men would do there.

Mr. BUTLER. It lies at the door as much to them as to us. The

proof is not in our hands.

Commissioner Russell. Yes, sir; but the point is to be proved by you, and the testimony being in your possession, you are to produce it, as I originally stated. The fact that Mr. Herschel made a plan for the canal has no tendency to show what the

dimensions or capacities of the canal itself are unless supplemented by proof that the plan was followed in the construction of the canal.

Mr. Butler. The trouble is, that the canal is irregular in all its parts, wider in some places than in others; in some places so wide that it will carry all the water 'that ever runs in the river, and in another part it is narrow. You saw it yourselves.

Commissioner Russell. All that is matter of evidence.

Mr. BUTLER. If I have to prove the width of every section and every foot, I cannot do it; therefore, I will not say that I can; but I think I can prove enough to satisfy any reasonable

man, unless there is some rule of law that excludes it.

Commissioner Russell. The witness himself says that he cannot state what the capacity of that canal is simply from a computation of the capacity at certain portions of it the construction of which he knows of his own knowledge. He can, therefore, state the construction and capacity of the canal in those portions of it to which his knowledge extends, and its capacity and construction at other portions must be proved by other testimony.

Mr. Butler. Very well, I will try to get one part.

Q. Was any portion of that canal widened as you made the plans?

A. It was.

Q. What would that portion carry when the water at the head of the canal was level with the top of the dam, if the rest of the canal was of the same capacity? How much would the section which you know was widened according to your plan carry with the water at the head of the canal level with the top of the dam?

A. With the water at the head of the canal at the level of the top of the permanent dam, and drawing down six inches in its whole length, or rather four and a half inches down to the Lawrence-street bridge (I take that as the ruling point), it would carry 368 cubic feet per second. That was the calculation I made at the time.

Q. Now, sir, whether you have been employed as an engineer to measure the amount of water which the canal did carry afterwards?

A. Yes, sir. Q. When?

- Λ . I measured it in March of this year, March 20th, in the afternoon.
- Q. At the request of an opponent in a law-suit of the Wamesit Power Company?

A. Yes, sir.

Q. How much did you find then actually running in the canal?

A. There was running 382 cubic feet per second.

Q. How much was the head down at that time at the bridge?

A. Down to the Lawrence-street bridge from the head-gates there was a fall of .574 of a foot. I averaged it during the time of the gauging. It fluctuated a little, but that is the true average.

Q. Over what space of time did that measurement continue?

A. I commenced at 2.25 P. M., March 20, 1876, and it ended

at 5.12 P. M., March 20, 1876.

Mr. Butler. It may be convenient to know that on March 20, 1876, it was running six inches over the dam by Tilton's measurements.

Mr. Shattuck. That morning it was six inches, and the next morning it was seventeen. Let us see when the rainfall was.

WITNESS. I think I ought to call attention to the fact that my

gauges were taken inside the head-gates.

Q. And the water is controlled in that canal, like others, I suppose, by head-gates?

A. Yes, sir.

Q. So that was the height of the water in the canal, and not the height of the water in the river?

A. Yes, sir.

- Q. What was the case in connection with which you made that measurement?
- A. The Lowell and Andover Railroad against the Wamesit Power Company.

Q. Now, Mr. Herschel, did you take it any other day?

A. I never completed any other measurement. I think I went up there once, but something interfered.

Q. (By Mr. Child.) Mr. Herschel, you have measured the

Concord river, have you?

A. Yes, sir.

- Q. Will you refer to your map and explain how you took the measurements as to the accuracy of them, taking the measure of Concord river at Massic Falls?
- A. This black line represents the average discharge in cubic feet per second at Massic Falls dam, at Lowell, every twenty-four hours, beginning on July 6, 1876, and ending September 24, 1876. It was taken night and day; and each average for the twenty-four hours down on this plot is the average of 48 half-hourly gaugings.

Q. What is the part of this black line which is dotted?

A. From the 17th of August down to the 23d of August, inclusive, owing to the rebuilding of the Massic dam, we were unable to take the gauges, and the dotted line is an interpolation for those days made, according to my best judgment, from what I saw of the working of the river the rest of the time. Up to this interpolation period, commencing August 17, the water was flowing partly over a dam, and partly through a flume. After that time, it was wholly over a dam that I had fitted with flash-boards, made in correct shape, the shape of a weir, and a box and hook gauge to take the heights.

Q. Were those measurements made according to your best skill

and judgment as an engineer?

A. They were made as carefully as I could make them in that place, and with those materials.

Q. Now, as to the flow of the Concord river, what is the character of it?

A. The Concord river during that period showed several peculiarities. It was very sensitive to the shutting down and opening

of the mills. Every night-time the flow would fall down very low, sometimes as low as 20 cubic feet per second for several hours, — the whole flow of the river. I have here the gauges which I took three weeks - representative weeks. One is from July 7th to July 13th: one from August 3d to August 9th, and the other from September 10th to September 16th, which show the maximum and minimum flow in twelve hours. The maximum is from 6.30 A. M. to 6.30 P. M.; the minimum from 6.30 P. M. to 6.30 A. M., the day following. I have shown there the maximum and minimum for each of those days. If it runs 350 cubic feet per second in the daytime, at night it will not run more than 50 or 60. There was but very little waste at night the first three weeks, and then when that freshet came, July 31st, it began to waste nights, and continued to run about even in the day until about August 9th. August 9th, for example, the average for the 24 hours was 380 cubic feet a second, and the average for 12 hours of the day was 414.9. The minimum for 12 hours was 320.5. Up to that time, the river was uniformly falling. After the freshet, it fell night and day. After that time, the condition of things was that in the evening the river would be drawn down a little, and then during the night it would begin to rise, the water all the time wasting. That stage continued until August 24th. Then we got down to the ordinary run of the river again. Then the average was 150 cubic feet per second for the 24 hours, and the maximum for 12 hours would be about 180. I say "about." After that day, I have not calculated except from my eye on the plot of it. The minimum for 12 hours was 70 cubic feet per second. So that when they were using 180 cubic feet per second during the day, they were wasting 70 at night. Some such proportion as that it would be all through. Witness presented table marked "C. H. 1."]

"C. H. 1."
Concord River Gaugings.—1876.

			CUBIC FEET PER SECOND.	
DAY OF WEEK.	DAY	of Month.	Max. 12 hours' flow. 6.30 A. M. to 6.30 P. M.	Min. 12 hours' flow. 6.30 P. M. to suc- ceeding 6.30 A. M.
Friday	July	7	145.5	79.8
Saturday	"	8	139.0	58.5
Sunday	"	9	32.0	42.0
Monday	"	10	200.0	80.0
Tuesday	"	11	184.0	80.5
Wednesday	66	12	176.0	110.5
Thursday	66	13	110.2	84.5
Thursday	Aug.	3	758.0	723.5
Friday	"	4	740.0	677.1
Saturday	66	5	669.8	604.9
Sunday	66	6	568.5	521.5
Monday	66	7	508.0	446.0
Tuesday	66	8	454.7	376.0
Wednesday	66	9	414.9	320.5
Sunday	Sept.	10,	51.0	85.5
Monday	44	11	224.1	63.5
Tuesday	66	12	202.1	50.9
Wednesday	"	13	155.5	61.0
Thursday	66	14	141.1	71.5
Friday	44	15	173.2	77.8
Saturday	44	16	134.2	49.5

One cubic foot per second on an eleven-feet dam gives a little less than nine-tenths of a horse-power.

Q. What was the effect of the rainfall upon Concord river during your examination?

A. This represents a summer period. The rainfall ordinarily has very little effect. The blue lines represent the average rainfall on the whole water-shed above the dam. I have compiled it from the records at South Framingham, at Lake Cochituate, at Concord, and at Lowell, on the day it fell. I have averaged it for the whole drainage area. Sometimes there would be a rainfall at one place when there would be none at another, or more at one place than another, and I have averaged it to represent the rainfall on

the whole district. Here is a rainfall of three-quarters of an inch, and the next day one of eight-tenths of an inch, and it has hardly any appreciable effect. It was followed, three days after, by another four-tenths of an inch. The rainfalls I have just spoken of occurred July 10th, 11th, and 14th. Then there were rainfalls on the 17th, 19th, and 20th. On the 23d of July we have a rainfall of very nearly two inches — 1.95.

Q. What effect did that have, if any?

A. That had hardly any effect upon the river, simply because the ground was dry and drank it all up. But just about a week from that time we had a rainfall of 3.74, and that is what made the freshet, coming on top of the soaking of the week before.

Q. Will you explain a little more fully the reason for the difference between the effect on the river of the second and the first

rainfall?

A. A good shower of 1.95, nearly two inches, on the 23d of July, had hardly any effect on the Concord river for the whole week following; but that rainfall soaked the ground sufficiently so that another one coming on top of it the week after, of nearly three and three-quarters inches, on the 30th and 31st of July, made a freshet, and ran the river over. It is not shown on this plot, but the night that rain commenced the river was down to 20 cubic feet per second. They stopped all the mills, and the rainfall ran it up to 733 cubic feet per second, on the average, within four days, and then from there it fell two weeks and more until it got to its ordinary state again.

Q. Now, will you state whether as an item of power in manufacturing, you can calculate the average flow of the river on this

map from the 6th of July to the 24th of September?

A. Yes, sir; I could calculate what the average flow was.

Q. I don't mean that, but what would be its advantage as power in the mills on the streams?

A. It wouldn't show what you could use there, in any sense of

the word.

Q. So that the average taken through the summer months, or through the year, does not show the power that is furnished to the mills during the dry seasons?

A. It would show probably fully double the water they can use.

Q. Is the average rainfall of one month of any value?

A. None at all.

Q. Will the average by weeks give it?

A. Worse yet. The shorter the period, the less it would show the portion that the mills could use. If it was fifty years it would show something.

Q. Will you illustrate this point, that the average is of no

value whatever?

A. Take this rainfall here of two inches. One would calculate from that that it would produce a great deal of water; but practically, for a whole week following, it had hardly an appreciable effect on the river. And this three and three-quarters inches of rainfall on the 31st of July would show a very large quantity, and it did produce a large quantity, but it did no good to the millowners: it could not be held. It all went away, night and day.

Q. Is an average estimate from the rainfall of any district for a year, or for a month, or for a week, of any value, or can it be relied upon as power for the mills upon that stream?

A. It cannot be relied upon.

Q. Can the rainfall upon a water-shed be calculated exactly as to the amount of water produced in the stream which can be used by mills?

A. No, sir.

Q. And why not?

A. The distribution of the rainfall is a matter of the greatest importance. Whether one rainfall follows right after another, or at longer intervals, and in dry months or wet months, and the amount of storage there is on the stream, and how that storage operates — all these are points that have to be taken into closest consideration. Practically, nothing tells the story so conclusively as absolute measurements and observations on the stream.

Q. Now, will you explain the flow of the river in the day and

the waste at night, and the use by day?

A. That table shows it for three weeks. I have calculated the average there. I have the records, of course, for every half-hour during that whole time.

Q. (By Mr. Richardson.) What do you mean by "they," when you say they were wasting 70 cubic feet per second at

night:

A. I don't remember just my expression, but it must have referred to the mill-owners above. I used that expression simply because the rule is, that mill-owners who work during the daytime do nothing at night; and if you see water running at night, the thought is that it is being wasted. Sometimes it was wasted, because nobody on the Concord river could use it.

Q. It was water that could not be used in the daytime?

A. It was water that was not used in the daytime.

Q. (By Mr. Child.) Now, Mr. Herschel, what is the yellow line on this map?

A. The yellow line on this map shows the flow of Sudbury river as measured by the city of Boston, simultaneously with these gauges of the Concord.

Q. What did you have to do with this yellow line?

A. I plotted this line from notes given me by Mr. Fteley.

Q. Now, what is the relative flow of the Sudbury and Concord rivers in the dry season according to these profiles?

A. It is about one to ten.

Q. That is, the Sudbury river furnishes at Massic dam onetenth of the flow of the Concord river according to this plan?

A. No, sir; I don't say that. I say the Sudbury river up country furnishes about one-tenth of what flows into the Concord.

Q. (By Commissioner Russell.) The Sudbury is measured and represented by the measurements on this plan as one-tenth of the flow of the Concord, as shown by this plan — that is what you mean?

A. Yes, sir.

Q. (By Mr. Butler.) Suppose the flow of the Sudbury at

South Framingham to be represented by the yellow line, then that flow would be about one-tenth in volume of what went over Massic Falls?

A. Yes, sir.

Q. The flow of Sudbury river was equal to one-tenth of what

went over the dam at Massic during the same time?

A. The difficulty is, that, during all this time, there was some Sudbury-river water that went down, and some of it went to the City of Boston, and the black line shows just as it was gauged. It includes some of the Sudbury, but not all of it; and in that way that is about a tenth.

Q. In other words, the Sudbury river furnishes, instead of one-fifth, as has been stated, in a dry season, only one-tenth of the

water in Concord river?

- A. The relation between the two would be shown by the yellow and red lines. The red line shows the Sudbury added to the Concord.
- Q. That is, if I understand it, if you assume that all the water that was measured in the Sudbury in Framingham went into the Concord, then you would have an addition at the Concord of the black line to the red line?

A. Yes, sir.

- Q. (By Mr. Child.) Now, will you tell us why the flow of a large stream and of a small stream do not compare with the watersheds of the two streams?
- A. It is very clear to my mind, but I don't know that I can make it clear to others. A large river is a large river simply because it is in a very low situation with respect to its surroundings. It is low down, and therefore it catches more water from the surface and from underground streams. A small river is a small river because it is high up, and does not catch so much water on the surface nor from underground streams. These underground streams feed large rivers much more than they do small rivers, on the upper parts of a water-shed. They catch a good many more of them, and hence feel them more. It is an actual fact, that large rivers near the sea have been wholly diverted by dams, and yet within three or four miles they would appear again out of the ground, being fed by those underground steams. In the small rivers produced in the upper parts of water-sheds, no such fact appears. The underground streams there are so small in quantity, that they cannot get above the surface, or else they have gone further down, and feed larger streams. The consequence of this is, that streams in the upper parts of drainage areas, high up, dry up completely in the summer, where no such thing is possible in a larger river; and as these gauges refer to just those dry times, they show just that fact, — that the larger river furnishes, in proportion to its water-shed, much more water than the small. I don't know whether I have made it clear; but it is clear to my mind, and has been for some time, that these upper parts of water-sheds are not so prolific in water as the low parts near the ocean.
 - Q. (By Mr. Butler.) But in a wet time, you would not expect

to find that difference?

A. In a wet season, the smaller ones go down all at once. They are quicker streams nearer the head; lower down they are more regular. The Mississippi is one of the most regular streams.

Q. That is, the upper Mississippi would rise and fall very rapidly, while the lower Mississippi would be hardly affected?

A. It would change very slowly. I want to say another thing to illustrate it further: that, if we could suppose Sudbury river to be deepened 100 feet, the whole valley of the river sunk 100 feet, it would yield more water. It would catch more of the under-flow, which now goes elsewhere. That illustrates the value of having a river-bed not too high above the level of the sea.

Cross-examination.

Q. (By Mr. Shattuck). Don't you know that it was very much dryer in the early part of the season in the southerly part of Massachusetts than in the northerly?

A. I don't know any such fact, though it may be so.

Q. Probably that is so, is it not, from what you saw of the Sudbury and Concord rivers?

A. I know nothing, except from the record of the Concord

water-shed.

Q. Is not the best test of the value of a stream the amount of its water-shed? That is one measure depended on, is it not?

A. I should say that is the chief factor. There are several,

and that is one of them; the principal one, I think.

- Q. Will you state what quantity of water was running in Concord river on the 10th of August at half-past eight in the morning, at Massic Falls?
- A. The 10th day of August was Thursday. At half-past eight in the morning (it varies very much about that point of time; it is going up very lively) it was about 415 cubic feet per second.
- Q. How wide is the Wamesit dam? How long is the space over which the water runs?
 - A. I don't know that; it is a zig-zag dam.

Q. How long should you say it was?

A. I should not guess at all.

- Q. How long should you think it was? You must have a judgment about it?
- A. I haven't any judgment about it. I haven't any opinion. It is a zig-zag dam.

Q. Can't you tell whether it is 500 feet long or not?

A. Well, sir, I can't tell. I don't guess at a thing which is a subject of measurement; I make it a rule not to.

Q. Is it as much as 200 feet?

A. I don't know.

- Q. Should you say it was over fifty?
- A. Yes, it is over fifty. Q. Over one hundred?

A. I guess it is.

Q. Over two hundred?

A. I don't know.

Q. How much water will run over a dam 200 feet long, when the water is six inches deep running over it?

A. That I don't know.

Q. Can't you tell approximately?

A. No, sir. If you will give me time I think I can figure it in my head.

Q. How much water, six inches deep, will run over a dam one

foot long, making allowance for friction?

A. I should as lief calculate for 100 feet as one.

Q. You know approximately, don't you?

- A. No, I don't know approximately. We either sit down and calculate these things, or we take them from tables that we know have been carefully calculated.
 - Q. Have you any table that will tell you how much water, six

inches deep, will run over a dam one foot long?

A. No, sir.

- Q. Haven't you got it in your memory, so that you can tell?
- A. No, sir. We don't carry those things in our heads; it would be impossible to find room for all those things.

Q. You have not even an approximation?

A. No, sir.

Q. You can't tell anything about it?

A. No, sir.

Q. You can't tell whether Wamesit dam is 200 feet long or 500?

A. I cannot, sitting here.

Q. You cannot give any judgment about it?

A. No, sir; I haven't any clear judgment about the length of a zig-zag dam.

Q. You can't tell approximately, how much water, six inches

deep, will run over a foot of surface?

A. I cannot, sitting here. I can calculate it. [Referring to book.] This table gives the discharge, for six inches deep, over one foot in length, from 75 to 70 cubic feet a minute. Calling it 72½ per minute, it will make 1.2 cubic feet per second.

Q. Now, if the dam was 200 feet long, it would carry 200 times

that?

A. That would depend upon what sort of a dam it was.

Q. I mean roughly; I am not going into nice calculations; but about that?

A. Yes, about that.

Q. Now, if at the time you measured, on the 10th day of August, you found 415 cubic feet, that included what was rnnning over the Wamesit dam, through the Wamesit canal, and also Meadow brook, didn't it?

A. Yes, sir.

Q. Now, if the water was six inches deep, as appears by the table of Mr. Tilton, at that time, on the Wamesit dam, how much do you think was running over the Wamesit dam?

MR. BUTLER. That depends upon how long the Wamesit

dam is.

Mr. Shattuck. That is what I want to know, if he can give

any judgment.

A. I should not want to testify about the Wamesit dam, for a time when I am measuring at the Massic. It would be about 1.2 of a foot per second, multiplied by the length of the Wamesit dam.

Mr. Butler. If the Wamesit dam was straight. I think that would make a difference.

Mr. Shattuck. Some difference; I don't want it accurately.

- Q. Then how much, in your judgment, was running through River-meadow brook at that time?
 - A. I don't know.
 - Q. Didn't you measure it all?

A. No, sir.

Q. Did you tell me that you thought the Wamesit dam was as much as 100 feet long?

A. Yes, sir, I said I thought likely it was.

Q. Then you may assume that it was 100 feet long, and, assuming that the water was six inches deep, how much would be running?

A. It would be about 120 cubic feet per second.

Q. Was River-meadow brook swollen at that time?

A. Well, I don't know; that was before the end of the freshet.

Q. Deduct 120 from 415, and it would be what came through Wamesit canal, wouldn't it?

A. I don't know how the pond was; it might have been rising and it might have been falling. There is a mill-pond between the Wamesit and the dam where I was. It might have been rising or falling; I don't know anything about how that was.

Q. Have you any reason to suppose that the water did not run

over the dam at the mill-pond that day?

A. That is always going up and down.

Q. But that day, when there was six inches of water going over the Wamesit dam, that pond was practically full, wasn't it?

A. You did not ask me about any day; you asked me about half-past eight on the 10th of August; that was a fixed minute.

Q. If there was six inches going over the Wamesit dam, have

you any doubt that the pond was full?

A. I should say it might be rising or might be falling; I don't know.

Q. Did you attempt to ascertain the amount of water running through the Wamesit canal, by actual measurement of the water, as you measured it below?

A. I have not measured the Wamesit Canal since the 20th of

March.

Q. That is not an answer to my question. How did you measure it then?

A. I went up there and measured it.

Q. Tell me exactly with what instruments.

A. I measured it at the saw-mill with a current meter.

Q. State exactly how you did it, what you did in getting at the measurements of that water.

A. There was a log thrown across the canal at the saw-mill on which we stood, and we made a cross section.

Q. Have you got the plot?

- A. No, sir, I haven't got it here.
 Q. State exactly how you did that?
- A. Well, sir, I had two assistants, and the first thing we did we measured off that log into foot lengths; made a mark at these places; then I took a piece of pine board about four inches long and three-quarters of an inch thick. No, they were laths, come to think of it; we took some laths and chopped them up into little short sticks and we nailed those on the foot marks so as to show us very clearly where the footmarks were; then I took a pole which I had had sawed out down at the saw-mill, —it was about two inches square, - and on that foot-pole I marked out foot-lengths and tenths of a foot. I took those off from the levelling rod, so as to get them accurately. That pole would sometimes be used by one of us and sometimes by another. The operation was repeated, and I don't know which one of us handled the pole and which one took the notes. But, at any rate, there was a change made; first one and then the other took it. We put that pole in the water where we had nailed these laths on the log, and by sticking the pole in the water, you could see how far the water came up on it, and you could read the mark and tell how deep the bottom was below the surface of the water.

Q. How could you tell how deep the bottom was? By touching

it, do you mean?

A. Well, the sensibility of the human hand is something very wonderful. You can tell not only when you strike the bottom, but you can tell whether it is hard or soft.

Q. Sensibility told you exactly where the bottom was?

A. Yes, sir; told us where the bottom was when we struck.

Q. Was it mud or gravel?

A. I should say it was gravel at that place. That is what my sensibility told me. I have been accustomed to sounding in a great many places.

Q. You stuck the rod into the water until you struck the bot-

tom?

A. Yes, sir; and then the surface of the water as shown on the rod shows how deep the bottom is below the surface of the water. At the same time, we have a guage which is graduated into feet and tenths and hundredths of a foot, and we have that nailed up where we can see it when we are sounding, and we read that guage every few minutes, perhaps every sounding, I don't remember how often.

Q. You nailed the guage right side of the canal?

A. Right side of the canal, so as to see whether the water staid constant or not, If it varies, of course we read it oftener. Then we take the average reading of that guage and measure the depth of the canal below the surface of the water, every foot in width, and then we see what the average water level was during the whole operation. We reduce the depths of the bottom down to the same reading as the guage, so that the guage and the level of

the bottom shall both count from the same zero, and that operation is repeated, as I said, another party taking the rod from the one who had it before, and having the widths and depths, of course that gives the cross sections of the canal.

Q. You used what instrument in measuring? A. I used a current meter which is my property.

Q. To what extent was that used?A. I used it to make the gauging.

- Q. Where? At the top of the water or bottom, and to what extent?
- A. Well, sir, it was used at twenty stations; it was used at twenty points, varying throughout, top and bottom and sideways, and every way.
 - Q. Was the water running over the flash-boards at that time?

A. Well, I have no doubt it was, although our gauge, as I said, was inside the head-gates.

- Q. Do you know anything as to what extent the gates of the different mills were open at that time, and as to how many mills were using the water at that time?
- A. No, sir; the object of that gauging was to see what the canal would carry under certain conditions.

Q. Do you know what the head of water was at the dam?

A. I know what it was inside the head-gates of the dam of the canal.

Q. What was it?

A. It was nearly a foot above the permanent dam; not above the flash-boards—above the permanent dam. It was grade 25.965. 25 is the top of the permanent dam, so that it was .965 above the top of the permanent dam. It is 11½ inches above the permanent dam, very nearly.

Q. Can you give any estimate of what would run in that canal

if it was six inches above the flash-boards?

A. I have not got it figured out. I could calculate that.

Q. Well, state it in a general way. Have you made any measurements to ascertain how much that canal would carry? Can you answer that question soon?

A. I cannot very well.

Q. Perhaps you had better calculate it and then answer it. Can you tell us how much water that canal would carry when it is even with the top of the main Wamesit dam, - not the flashboards, but even with the top of the dam?

A. Well, I can under certain falls.

- Q. You may give the estimates with the fall of the canal as it was.
- A. If the water at the head-gates was even with the top of the stone dam, and the water at the Lawrence-street bridge was 41 inches lower, it would carry about 220 cubic feet per second.

Q. Have you estimated how much it will carry when it is even

with the top of the flash-boards?

A. I have not got that. I will give you everything I have got here. I have got it in the first place as it was when I measured it, running 382 cubic feet per second, and the fall on the length of 1,925 feet was .574 of a foot, and the cross section of it was 188.38 square feet. What is called the hydraulic mean depth for the whole canal was 1.738. I calculated that if the fall had been four inches instead of .574 of a foot, we should have had the quantity 287.88 cubic feet per second.

Q. What was the height of the water at Wamesit dam?

A. The same, .965 of a foot above the permanent dam; and if you increase the fall half an inch, to $4\frac{1}{2}$ inches, it would make the quantity 305 cubic feet per second. Then I have that other calculation that I gave you of 220 cubic feet per second.

Q. Did you make any other calculations when the water was

at the height of the main dam, with a larger loss of head?

A. I have given you everything I have got.

Q. Now as to the accuracy of measurements by the current meter as compared with the measurements which you have made during the last month or two: how do they compare? I mean, how do the measurements which you made on the 20th of March compare with the measurements of the water which you have been

making recently?

A. Well, sir, I tested that identical instrument last summer, measuring at the same time the same quantity of water with floating tubes; and if you take off five per cent. of the indications of that instrument, you have got it just as near as a tube will give it, or any other way that I know of, unless it is an iron weir, and by the most delicate measurements. I find it to measure just five per cent. more than the actual flow.

Q. Did you try more than once?

A. Oh, yes, indeed. There were nine tube measurements, each of which lasted half an hour or more, and during the half-hour I measured with the current meter, say five times; that would give 45 measurements with the current meter.

Q. Do you know how long the Wamesit canal is?

A. I gave you the length from the saw-mill to the Lawrence bridge, 1,925 feet. If you count the Bleachery as the end of it, I can only give it by guess.

Q. If you have a general recollection you may state it?

A. I should think four hundred feet more.

Q. (By Mr. Storey.) Do I understand you to mean that that measured flow on the 20th of March is subject to correction by deducting five per cent.?

A. Yes, sir; I give it to you just as I had it in the book, and

these experiments with the current meter were made since.

Q. So that it should be 19.1 less than the amount which your current meter shows?

A. Yes, sir; that is as near as I know now. I am not positive about it; the instrument may be nearer correct after all. It takes more than the few experiments I made to be *positive* about it. I give you the best I know now. I might go out to-morrow and make more experiments which might make a difference of a few per cent. the other way?

Q. Is it not generally considered that the measurements by a current meter are about ten per cent. less correct than measure-

ments made the other way.

A. No, I don't know any such rule as that.

- Q. The plan that you made, as I understood you to say, for the enlargement of the canal, was to give 368 feet per second on a fall of 4½ inches at the Lawrence-street bridge, when the water was as high as the main dam. That was the plan which you made, wasn't it?
- A. Yes, sir.
 Q. The actual capacity of the canal with that loss of head and at that height, is about 220 feet, is it not?

A. So it seems.

AFTERNOON SESSION.

Mr. Butler. I now offer the tables which have been referred to, which represent the black line on the diagram produced by Mr. Herschel.

Average Flow from Midnight to Midnight of the Concord River, as gauged at the Massic Dam, Lowell, Mass.

1876.

DAY OF WEEK.	DAY	of Month.	CUBIC FEET PER SECOND.	RAINFALL IN INCHES.
Thursday	July	6	134.0	
Friday	"	7	111.5	
Saturday	66	8	107.0	
Sunday	66	9	33.5	
Monday	66	10	133.0	0.764
Tuesday	. "	11	131.5	0.814
Wednesday	66	12	141.0	
Thursday	"	13	149.5	
Friday	66	14	144.0	0.408
Saturday	46	15	133.5	
Sunday	44	16	77.0	
Monday	"	17	150.5	0.077
Tuesday	"	18	130.0	
Wednesday	"	19	129.0	0.015
Thursday	66	20	128.5	0.163
Friday	66	21	133.5	0.011
Saturday	66	22	115.0	
Sunday	66	23	47.0	1.952
Monday	66	24	155.0	
Tuesday	6.6	25	150.0	

Average Flow, etc. - Continued.

1876.

DAY OF WEEK.	DAY OF MONTH.	CUBIC FEET PER SECOND.	RAINFALL IN INCHES.
Wednesday	July 26	151.0	0.027
Thursday	" 27	143.0	
Friday	" 28	141.0	
Saturday	" 29	141.0	0.035
Sunday	" 30	85.0	
Monday	" 31	382.0	3.740
Tuesday	August 1	567.5	•
Wednesday	" 2	686.0	
Thursday	" 3	734.5	
Friday	" 4	722.5	
Saturday	" 5	659.0	
Sunday	" 6	568.5	
Monday	" 7	496.0	0.150
Tuesday	" 8	433.5	0.038
Wednesday	" 9	381.5	
Thursday	" 10	332.0	
Friday	" 11	292.0	
Saturday	" 12	253.5	
Sunday	" 13	204.0	
Monday	" 14	214.0	
Tuesday	" 15	179.5	0.261
Wednesday	" 16	183.5	
Thursday	" 17	(192.0	0.157
Friday	" 18	200.0	0.190
Saturday	" 19	g 195.0	
Sunday	" 20	195.0 123.5 174.0	0.290
Monday	" 21	首 174.0	0.029
Tuesday	" 22	152.0	
Wednesday	" 23	163.5	
Thursday	" 24	151.0	
Friday	" 25	153.5	
Saturday	" 26	135.0	
Sunday	" 27	43.0	
Monday	" 28	134.0	
Tuesday	" 29	125.0	
Wednesday	" 30	117.0	

Average Flow, etc. - Concluded.

1876.

DAY OF WEEK.	DAY	ог Молтн.	CUBIC FEET PER SECOND.	RAINFALL IN INCHES.
Thursday	Augu	st 31	113.5	
Friday	Sept.	1	125.5	
Saturday	"	2	112.0	0.150
Sunday	"	3	45.5	
Monday	66	4	134.0	
Tuesday	66	5	117.5	
Wednesday	66	6	126.0	
Thursday	66	7	124.0	
Friday	66	8	141.5	0.010
Saturday	66	9	130.5	0.113
Sunday	66	101	52.0	
Monday	66	11	155.0	
Tuesday	66	12	128.0	
Wednesday	66	13	108.0	
Thursday	66	14	104.0	0.004
Friday	66	15	124.0	0.005
Saturday	66	16	99.5	
Sunday	66	17	27.0	1.180
Monday	66	18	167.0	0.595
Tuesday	66	19	216.5	0.732
Wednesday	66	20	209.0	0.060
Thursday	66	21	196.5	0.014
Friday	66	22]	205.0	
Saturday	66	23	172.0	
Sunday	"	24	138.5	0.027

N. B. — Each daily average in cubic feet per second is the average of forty-eight half-hourly gaugings.

Q. (By Mr. Butler.) Will you state what this table marked "C. H. 2" represents?

A. It represents the black line upon the diagram, in reference to which I testified this morning, to wit: the average flow from midnight to midnight, of Concord river, as gauged at the Massic dam from July 6th to September 24th.

The figures in the last column are the average of the rainfall on the *whole* drainage area above Massic dam, derived from the observations taken at South Framingham, Lake Cochituate, Concord and Lowell.

Cross-examination resumed.

- Q. (By Mr. Storey.) You have on this plan three lines, a yellow line, a black line, and a red line. I understand that the black line represents the actual measured flow of water at Massic dam?
 - A. Yes, sir; there are six days left out.
 - Q. And the flow on those days is estimated?
 - A. Yes, sir.
- Q. That black line represents the measurements which were taken by you, or under your supervision, and upon the accuracy of which you are ready to testify? You make a dot on each day at the average flow?
 - A. Yes, sir.
 - Q. And then you connected those days by a straight line?
 - A. Yes, sir.
- Q. This yellow line, which represents the flow of Sudbury river I understand is not plotted from your measurements?
- A. That is plotted from tables, the accuracy of which Mr. Fteley is responsible for.
- Q. You know nothing about the measurements upon which that line is based?
- A. I have been there and know how it was done; but I do not come here to testify about it.
- Q. In regard to the measurements represented by the yellow line, you do not intend to testify as to the system or apparatus that was employed?
 - A. No, sir; only, as I have been there, I happen to know how
- it was done.
- Q. Was it the same apparatus that was employed at the Massic Falls?
 - A. No, sir.
 - Q. It was not under your superintendence at all?
 - A. No, sir.
- Q. Somebody gives you those facts, and you plot them out on that paper?
 - A. Yes, sir.
- Q. Then I understand that the red line is made by adding to the black line the flow of Sudbury river as would appear by the yellow line?
- A. I did not plot the red line; Mr. Fteley will testify in regard to that; but I know what it is. It is the flow of Sudbury river modified by pushing it back three days; that is, allowing three days for the water to come from South Framingham to Massic dam.
- Q. That is, you measure at the city dam so much water, and three days after, you add the amount of water so measured to the amount of water at Massic dam, and that addition makes the plotted red line?
 - A. Yes, sir.
- Q. Now, I want to ask you a question or two about your theory that a large river is large because it flows low down in the country, and a small river is small because it is higher up?

A. That is true. I made that statement to illustrate the point I made in respect to drainage area, — a large river is lower, and a larger amount of water runs into it.

Q. Does that mean that as the water-shed does not let a large number of streams in to form the river, as you get nearer the

mouth, you will find the river larger?

- A. A large river is fed in the summer season, when there may not be any rainfall for two months, by underground streams; whereas a small river higher up would be beyond the reach of any such source as that.
- Q. Now, let me see if I follow your method of observation. You have found that the lower down a river is, the larger it is. Do you mean that that is the result of your observation, or is it a theory of yours? I merely want to know whether that theory is something like the theory that "large rivers run by large towns," or whether it is based on observation?
- A. I hope not. I was trying to explain. I said it was clear to me, but I did not know that I could make it clear to others. It is very clear that a large river is fed in the dry season, when there has not been rain for a long time, by underground sources which, in the case of a smaller river, would go a long way out of its drainage area, and would not feel it.

Q. Is that a theory of yours from facts that you have observed

on the surface?

A. Well, sir, we derive our knowledge as engineers from a variety of sources other than what are tested and sworn to, and we must apply it the best we can. I know it is an accepted fact by good engineers that large rivers which have had dams thrown across their lower reaches and their entire flow of water diverted, have reappeared within three or four miles in large volume, and become navigable streams, from entirely underground sources of supply.

Q. Haven't you ever known trout-brooks, very small streams

away up in the mountains, that had a perennial flow?

A. I suppose trout do live in streams that have a perennial flow, if that is what you mean. I know that small streams in the upper parts of drainage areas do not yield in dry times the same proportion of water that larger rivers do.

Q. Do you know how much difference there is in the heightabove tide-water of the Sudbury river above the city dam and the

Concord river at the Wamesit dam?

A. I don't know exactly.

Q. Do you know anything about the amount of fall that there is in the river between the city dam and the Wamesit dam?

A. I think I do.

- Q. The Sudbury river is one that flows with a peculiarly slight fall, isn't it?
- A. There is very little fall between the Saxonville mills and North Billerica.
- Q. There is little fall between North Billerica and the Wamesit dam?
- A. It depends upon whether you mean the bottom or top of the dam at North Billerica. There is very little fall from the bottom of the dam at North Billerica to the top of the other.

Q. Take the average height above tide-water of the Assabet and the Sudbury: do you know, in regard to the difference, whether the Sudbury is any higher than the Assabet, or lower?

A. No; I don't know.

Q. Have you examined the Assabet at all?

A. Yes; I have gauged it.

Q. Have you been up the Sudbury?

A. Not to follow the course of the stream.

Q. Of the two streams, the Assabet is, on the whole, the more rapid, isn't it?

A. At their junction it is, decidedly.

Q. Isn't it above? Take, for example, the Sudbury, and follow it up through the meadows at Concord, through Fairhaven bay, and up along the course of the stream, the flow is almost nothing, isn't it?

A. I believe so.

Q. Take the same distance from the junction of the Sudbury and the Assabet, and is not the flow of the Assabet much greater?

A. Yes, sir.

Q. Then the probability is that the average height of the Assabet above the height at the junction is greater than the height of

the Sudbury above the height at the junction, isn't it?

A. I see exactly the drift of your question. If you will allow me to state again what I said, you will see that you did not exactly understand me. I say these rivers must be low according to their drainage area. I do not say low above any fixed point; if they are high above the level of the sea, they generally have very little land that is still higher above them.

Q. Take it on your own ground: do you know how the height of the Sudbury as compared with the surrounding drainage area compares with the height of the Assabet as compared with its.

drainage area?

A. I should reason from their yield.

Q. In other words, having a certain theory, you assume that the facts must sustain it. Now, I want to know about the facts, in order to test the theory.

A. The drainage area is the amount of land that is higher than

the stream.

Q. I am asking now as to your observation. Of course, I know that as water has to run down hill, the drainage area of a stream must be above it; but what I want to know is, whether the drainage area of the Assabet is higher in proportion to the Assabet than the drainage area of the Sudbury is higher than the Sudbury?

A. I don't know what the average level of the water-shed is.

- Q. Take the Assabet river from its source to its junction with the Sudbury, and the Sudbury river from its source to its junction with the Assabet.
- A. I know that the Assabet drainage area has more ponds in it.
- Q. I am not asking you as to anything except the comparative height of the drainage area above the Sudbury.

- A. Well, I don't know what the average height of the land is above either of them.
- Q. But you know that the average height of the drainage area above the Sudbury does not differ materially from the average height of the drainage area of the Concord, above Concord, below the junction of the Assabet and Sudbury?

A. I don't know what the average heights are.

Q. (By Mr. Shattuck.) At one period this summer the water supply of the Sudbury was more than half of the whole of Concord river, wasn't it?

A. Well, I think on a single day it was about half.

Q. It was more; it was 400 against less than 750, was it not?

A. There was a single day when it ran up considerably.

Q. How do you account for that?

A. Oh, the Sudbury is a quicker stream.

Q. Was there not a greater rainfall on that territory?

- A. I don't know how that is; the records, of course, will show that.
 - Q. You think the Sudbury is a quicker stream, do you?

A. Yes, sir.

Q. What makes you think so?

A. It follows a rainfall much quicker than the Concord. You can see that right before you on the plotting.

Q. I should say not; I should say they went up exactly on the

same line. On the contrary, it was not so quick.

A. Oh, yes, it was quicker. There is a rainfall here on the 23d of July which brings the Sudbury up appreciably, and it does not affect the Concord.

Q. Did not the great rain you had carry up the Concord river

more rapidly than the Sudbury?

A. No, sir; the height of the freshet on the Concord was several days after the height of the freshet on the Sudbury had passed.

Q. How many days?

- A. I have plotted the great rainfall half way between the 30th and the 31st, because from the records I did not get correct information as to precisely when it commenced and ended, but I know it rained that Sunday night. I plotted half way between the 30th and 31st day of July. The Sudbury had attained its maximum the first day of August, and fell very rapidly; it fell off 180 cubic feet in one day. It attained its maximum on the first, and the next day it was 180 cubic feet off, and in two days more it was 120 off; whereas the Concord did not attain its maximum until the 3d of August. That was the maximum of the Concord, and at that time the Sudbury had fallen down to be less than 150. It took the Concord over two weeks to fall down to its ordinary stage, and the Sudbury was all back in less than a week. I think that plot, if carefully looked at, will show how quick the Sudbury is in comparison with the Concord.
 - Q. (By Mr. Storey.) You mean quick to feel a rainfall?

A. Quick to feel a rainfall, and go down or up either.

Re-direct.

- Q. (By Mr. Butler.) Now, in regard to the canal. You calculated, if I understood you, that with the water at the height of the dam, and drawn down four and one-half inches at the Wameslt. it would give 220 cubic feet capacity per second?
 - A. Yes, sir.
- Q. And that calculation was made from the flowage of water in a section of the canal made up near the saw-mills?

A. That is where I gauged it; yes, sir.

Q. Now, I want to know if that section of the canal was of a size, in depth and width, which compared with your estimate? That is, was it the size, width and depth that you estimated it ought to be to carry 300 and odd feet per second without drawing down but six inches?

A. I can answer that from my general knowledge of the whole canal, not from a specific comparison of that cross section with

those I designed.

Q. Pardon me; was that comparison made by measurement made in a cross section of the canal, made of the width, depth, and height which you yourself desired it should be, when you made the estimate for the canal to carry the other amount? The other things we will take into consideration by and by.

A. That cross section at the head of the canal is, in my opinion,

large enough.

Q. Now did you measure the width of the canal, or the depth of the canal, at any other point on March 20th, or about that time, between that cross-section and the Lawrence bridge?

A. I don't think I did, then.

Q. Did you, at any other time, measure that, and if so, when,

after the last digging was done on the canal?

A. After the digging was done, I measured several times the rock section which lies in front of the Bolt Company, and, as I stated, that was finished under the second contract under my supervision, and I had to certify to the amounts taken out. That was finished right.

Mr. Shattuck. This has all been gone into before.

Mr. Butler. Oh, no, pardon me. You put in a new measure-

ment entirely, and I am trying to find out the data.

- Q. Now, with the exception of that rock cutting at the American Bolt Company, did you make any measurement after the digging was done of the canal, or take any section of the canal between the two?
- A. I measured several times in front of Mr. Faulkner's boarding-house, and between that and his mill.

Q. When?

- A. I measured while the work was going on by days' labor.
- Q. I understood that; but my question is whether you measured after the work was finished?

A. No, sir; I did not.

Q. Did you take any other cross section of the canal to get at your calculation than the one which you have described to Mr. Shattuck?

A. No, sir.

Q. Did you have with you the figures of any measurements made after the canal was finished, as much as it was finished, when you made that measurement and came to your results?

A. I had some of the data; I had not the measurements of the

canal.

- Q. I say, had you any measurements of the canal?
 A. No, sir, except the length; I knew the length.
- Q. There has been no alteration in the length of the canal, so far as you know, since the digging was there?

A. No, sir?

Q. Now proceed, if you please, to another question. If the canal, when the water is at the height of the permanent stone dam will only carry 220 cubic feet when drawn down $4\frac{1}{2}$ inches at Lawrence street, which I have supposed you estimate to be equal to six inches at the Bleachery?

A. Yes, sir.

Q. Then, if the wheel and gates of the several takers, other than the Wamesit Company are gauged at the capacity of their deeds, which I understand to be 220 feet per second, then those takers would take it all up and leave the Wamesit Power Company nothing? Would not that be the fact?

A. Yes, sir.

Q. It being in evidence, as I will assume for the purpose of this question, that all hands run in a dry time part of the day, including the Wamesit Company, running 246 horse-power, which would take 140 cubic feet, and the others taking, including machinery, 220 feet, and under those circumstances the canal would carry only 220 feet, where did the Wamesit Power Company get its water?

A. They drew the head down much more than $4\frac{1}{2}$ inches at the Lawrence street bridge.

Q. Then the more they drew down at the lower end, the more they would get, to a certain limit, would'nt they?

A. Yes, sir.

Q. If they drew down their head a foot, unless that oversteps the point of limit, they would run a great deal more water through the same canal than though they only drew down six inches?

A. Yes, sir. There is a certain limit beyond which they cannot

draw it down.

Q. And that limit would be in practice this? If you knocked the other end out of the canal, and left it free and open, with the same head at the head-gates, you would get the greatest amount of draft of water, wouldn't you?

A. Yes, sir.

Q. And opening a great amount of wheels, gates, and vents at the lower part of the canal would operate in the same way?

A. That would have the same effect.

- Q. So that the effect of the use of this canal has been, that the less water there was the more they would use,—that has that effect to them?
- A. The less there was the more they would use, is that the question?

Q. Yes, sir; they had the right to use only 288 feet, but there was a very much larger quantity used than that; and the lower the canal is, the more they would use, because they could get more?

A. I don't quite understand the question. There must be some-

thing I don't understand.

Q. Perhaps you don't; perhaps I don't make myself clear. I suppose that is my fault. I say, assume it to be shown here that the Wamesit Power Company run the water 246 horse-power, and other water-takers run 440 horse-power, and the canal, as they had a right to use it,—using only aliquot parts,—would, when drawn down to six inches, carry only 220 cubic feet, but by drawing the head down to that amount of water of which we have been speaking, 246 horse-power, and 440 horse-power could be got, then by drawing down the head at the lower end, when the water was low, they could get a great deal more than their aliquot parts, couldn't they?

A. Somebody did.

Q. So that, in fact, the more the canal was drawn down at the lower end, — down to a certain limit which you have not defined,—the more water everybody would be able to take — isn't that so?

A. The more water some one or more would be able to get. Q. Now, sir, is there any method that you know of of defining

how many inches or feet the canal would be drawn down?

A. Well, I think I could calculate what the maximum discharge of that canal would be. That is rather intricate, perhaps, and somewhat approximate. It is a legitimate question, however, for engineers to solve.

Q. You haven't done that?A. No, sir, I have not?

Mr. Butler. I am not anxious that you should. If anybody is, they will have it done.

Q. Is the method you took to measure the water one known and

approved among the best engineers abroad and here?

A. Well, it is a good way to measure water. I have tested it a number of times, comparing it with other methods that in turn have been tested, and there are certain localities where practically none other can be used, that I know of.

Q. I mean the water in a running canal, — can you measure it by that method so that the measurement can be relied upon?

A. There are a variety of systems by which the velocity of currents is measured, and some one of those must be used in some cases. The value of any way of measuring water depends upon the experiments that have been made upon that particular way.

Q. Now, upon the question of the amount of water that will run over a dam, assuming it to be a zig-zag line with sharp corners as the top of the rolling-way of the dam, is your formula as given in the books adapted to give an approximate result for the water which would run over such a dam, or is the formula given in the book from which you made your calculation as to the amount of water which would run over one foot at a height of six inches made from a straight line on a straight dam?

A. The experiments that have been made have been made on

straight dams; at the same time, I know of experiments made on the curved dams, or partly straight and partly curved, and application of the straight line formula to bends gives us an approximate result.

Q. An approximate result, and that only?

- A. To get exactly the results that are given by any formula, the precise form of the apparatus must be reproduced which was used when the experiments were made from which the formula was derived.
- Q. Do you know of any formula to apply to a zig-zag dam like that?

A. No, sir.

Q. Would not measurements over a weir be, in your judgment, a much more accurate way of determining the amount of water running over a dam than any calculation from such a zig-zag dam by a formula?

A. Well, my opinion is, from what I know of experiments, as I say, on dams that are not straight lines, the modification by their being curved or being bent is not very great. I should say the shape of the top of the dam had greater influence than the form of the ground plan of the dam.

Q. What shape of the dam at the top would give the best re-

sults?

A. To apply the formula, the shape of the top of the dam ought to be exactly the same shape of the apparatus that was used when the experiments were made from which the formula was derived.

Q. What is that shape?

A. That shape is different for different experiments, but in measuring water, we always try to reproduce the shape, as I say, which was used when the formula was made.

Q. In order to reproduce it, you must know what it is?

A. I say it is different. Different experimenters use different weirs. We use in this country the experiments that were made by Mr. Francis at the lower locks, Lowell, and that weir was made of two-inch plank, bevelled on the down-stream side so that the top was, I think, a quarter of an inch thick, or something like that, I don't remember exactly. If I was going to make a measurement as accurate as any measurement could be, I should go to the records of that weir and reproduce it verbatim et literatim to a dot, to a screw-head, and everything else.

Q. To get the exact result of a formula, it requires that there

be a substantially sharp edge go into the waterfall?

A. It ought to have a sharp edge on the up-stream side.

Re-direct.

Q. (By Mr. Child.) You said something about percentage to be allowed. I want to know how accurate this plot is that is made here, and whether the percentage has been allowed?

A. The experiments were made with my current meter and Mr. Fteley's current meter, and were made on purpose to test the accuracy of the guagings shown on the plot. A measurement made

by my current meter is correct within one or two per cent., as I now have given it. By taking off five per cent, from the quantity I gave as flowing in the canal, it also is correct within one or two per cent. It may be one or two per cent. too large or too small. It is as correct as any way of measuring water will be.

Q. It is as likely to err one way as the other?

A. It is as likely to err one way as the other. And this correction has been made. Ever since the interpolated part, the water was measured over a good weir-shaped plank.

A. FTELEY, sworn.

Mr. Child. We desire to offer profiles of the measurements of Sudbury river for three years, but with different degrees of accuracy. The measurements on the first map, for 1874, were taken on the days in which these zero marks and crosses are made on the profile, not being taken every day; these are actual measurements, showing different measurements in 1874 on the days indicated by these crosses and zero marks. [Profile put in showing the yield of Sudbury river in 1874, at the times indicated by the marks zero and cross.] Then here is a profile for 1875, which was taken by measurements made three times each day up to November, when there were the number of measurements indicated on the plan made on these different days; and then, from December 25th, there was a continuous measurement by a self-registering float. Up to November, measurements were taken three times a day. From November, measurements were taken very many times a day, and from December 25th the measurement was continuous. Profile put in of the yield of Sudbury river and Farm pond in 1875, showing the average flow per second for each day in cubic feet.] Then we have a plan for 1876, showing the continuous measurements by the instrument which we saw. [Profile put in of the yield of Sudbury river and Farm pond in 1876 (running to September 23d), showing the average flow per second for each day in cubic feet.

Q. (By Mr. Chilp.) How long have you been an engineer?

A. Eighteen years. Q. And where?

A. Partly in France, and eleven years in this country.

Q. To what branch have you devoted your attention?A. My practice has been as an engineer, and about seven years ago I devoted myself to hydraulics.

Q. Where were you educated?

A. In France.

Q. Where in France?

A. In Scientific School, sir.

Q. The first matter to which I will call your attention is this map, put in by Mr. Herschel. Is there a part of that map done by you?

A. The red line on this map was plotted by me, and I furnished the figures necessary to plot the yellow lines showing the flow of Sudbury river.

Q. Will you explain what that red line is, and how it is

plotted?

A. I have taken from the records of the gauge of Sudbury river the amount of water that has been diverted every day, whether it went into Lake Cochituate, or whether it was stored in Farm pond, and I have added to the quantity shown on the profile, in black, the quantity so found. The only difference is that as it takes from two to three days for water to go from Framingham to Lowell, I have shifted the records as shown by the red figures on this plan, so that the records shown on the 6th of any month would represent the diversion that actually took place three days before that, that is, on the 3d, in Framingham.

Q. You calculated that the water, if it had been allowed to run in Sudbury river, would have reached Massic dam three days

afterwards?

A. Yes, sir; that is what I have assumed.

Q. The red line is added to the black line, and the two together show what?

- A. The two together show what I believe would have been the natural flow of each river at that point, if the city had not diverted the water.
- Q. (By Commissioner Francis.) The red line is in addition to the black line?

A. Yes, sir.

Q. (By Mr. Child.) The red line shows the aggregate of the Concord and the Sudbury; the black line shows the Concord; and the difference between the black and the red shows the difference it would make to the Concord river if the Sudbury river had been allowed to flow into it?

Mr. Storer. I do not understand that he means the quantity actually diverted in the whole flow of the Sudbury, but the amount which in practice, the city actually took in and gave out. Is that not it?

A. No, sir; that is not it. This red line as it stands represents the whole flow at that place, where it was gauged by Mr. Herschel, supposing that the Sudbury river would have flowed naturally; consequently it included the diverted water, and also the water that was actually allowed to run.

Q. Will you explain what the space between the black line and

the red line shows?

A. The space between the black line and the red line represents the flow of Sudbury, which has not passed over or through the city dam at Framingham. What was not diverted by the city was allowed to run into the canal bed.

Q. And was measured by Mr. Herschel?
A. And was measured by Mr. Herschel.

Q. Then the difference between the black line and the red line shows what was actually diverted by the city?

A. Yes, sir.

Q. (By Mr. Child.) Now, if you will explain the yellow line?

A. The yellow line represents the flow of Sudbury river as it has been gauged at Framingham; it represents the natural flow of the river.

Q. The whole flow?

A. Yes, the whole flow.

Q. (By Mr. Storey.) Including that which is diverted and that which is not?

A. Yes, sir.

Q. (By Mr. Child.) Will you explain, if you please, your system of gauging the water by which you measured the Sudbury river, beginning in 1874, and taking it down to the present time?

A. To answer that question fully, I believe it is necessary that I should explain to a certain extent how the city dam is situated and the various channels through which the water will run. dam erected by the city is in Framingham, and above it is the river, of course; and above it also is the ditch that connects with Farm pond. That ditch lets the water of Sudbury river, when it is diverted, into Farm pond, and then, at the other extremity, at the southern end of Farm pond, is an outlet, controlled by planks, - temporary planks, - into the lake; consequently if all the sluices going into Farm pond are shut, the only gauging necessary is over the dam or through the flume which is connected with the dam, or somewhere on the main channel of the river. If, on the contrary, some water is diverted into Farm pond, then a gauging must be done of the water so diverted, and not only by the actual flow but also by the storage into Farm pond, if it is not to vary at all; then, thirdly, if the city is using the water from Farm pond into the ditch, there must be another gauging of the water so diverted. To measure these different flows, first, there is the dam itself, which has been so built that the planks used to make it higher and lower have been levelled, and the thickness or depth of flow over the dam itself is known. When the water is not high enough to flow over the dam, but is let run into the natural channel of the Sudbury, then that water must be measured in the flume which is connected with the dam. That flume is a square box of timber, well made, and of a sufficient length to make gaugings. Now, as a check to these, a certain section of the river has been prepared according to geometrical lines, so, if the velocity of the water is known, comparing it to the section, a check may be had of the gaugings made over the dam and through the flume. As to the storage in Farm pond, that has been measured by a scale placed in the water; and as to the flow into the temporary conduit which goes to Lake Cochituate, the gaugings have been done with floating tubes and also with current meter. Now, as to the methods used. First, in 1874 the observations of the river were only occasional; the river at that time was always flowing.

Q. And in accordance with that plan, are they?

A. According to that profile, yes, sir. The river at that time was flowing through the flume connected with the dams, except when the freshet might be too high and it passed over. At the time the water was passing through the flume the heights were recorded, sometimes every two and three and four days. During the intervals the level was not observed by instrument, and, as I lived in the neighborhood, — almost on the river, I should say, — I used to see whether the flow of the river varied much; and whenever

there was a variation which I could detect, I generally sent some one to take the measurement which I am speaking of. In November, if I remember right, — the profile shows, — we put some weirs in the flume, and for four days and four nights I had observations taken, just as exactly as possible, every ten minutes during the time the flow was passing over those weirs. I had the same kind of gauging made for a whole day and night in January, 1875, I believe. Now, in 1875, when I commenced to apply some more accurate method to the whole flow, I observed the river again when it was flowing through the flume connected with the dam, and the condition of the river being the same above and below, I actually measured the flow in that flume corresponding to certain heights of the water; and I have applied these results so found to the levels that I had measured in 1874, with the exception, of course, of the gaugings of November and January which I have spoken of, and which were taken by weirs. From January, 1875, I commenced to take observations every day, once generally, or more, and by the end of April, I believe, the observations were taken three times a day, morning, in the middle of the day at some regular times, and evening. Then, a little later, I applied the current meter to those measurements, and a large part of the gaugings during that year were made with that instrument. As far as the portion that was run into Lake Cochituate through the temporary ditch, I had, however, another method. I used some floating tubes for determining the flow, and after determining the flow at a certain elevation I constructed a table by which I used to measure the flow every day. At the end of that year, in December, 1875, — at the end of the month, rather, — I put up an apparatus, a self-acting float, or, rather, a self-registering float, to give us the level of the river at the dam at all times at night and day. The profiles made by this apparatus were by a certain scale, and every day, sometimes twice a day, whenever the opportunity presented itself, the heights of the water were measured by the gauge in order to control the profile made by the self-acting apparatus. During that year, 1876, when the float was used, the other methods have also been used of measuring a weir and using the current meter.

Q. As far as you know, have all the proper applications known to science been used for the measuring of the water in the Sud-

bury river to get it accurately?

A. Not all the time, sir.

Q. But the last part of the time?A. The last part of the time, yes, sir.

Q. And the other part of the time you have fully stated the

way in which you did it?

A. Yes, sir. I want to make an observation here. In 1876, this year, there has been a very large freshet, so large that our dams were not ready to carry it, and I would not call the measurement of an extreme freshet as accurate as the rest; I would call it less accurate.

Q. Where do you live?A. I live in Framingham.

Q. And how near the Sudbury river?

A. About half a mile.

Q. And where is your office?A. In South Framingham.

Q. And in going from your house to your office, you cross the Sudbury river?

A. Yes, sir.

Q. How long have you known and watched the Sudbury river?
A. I have known the Sudbury river from May 1873, to this date.

Q. Please explain what these tables are?

A. These tables represent the flow of Sudbury river as it was estimated in 1874, and the beginning of 1875, as I explained it, for the time the observations were taken, and for the latter part of 1875 and 1876. It is the daily flow in millions of gallons for twenty-four hours, represented in black letters, and in cubic feet per second, represented in red figures.

Commissioner Russell. Table marked "A. F. 1."

[Owing to the difficulty of printing the tables as presented by the witness, the figures giving the flow in gallons and the black and red crosses are omitted.]

"A. F. 1."

Table showing Daily Yield of Sudbury River and Farm Pond during 1874, in cubic feet per second.

DAY.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1												
2					621.9	227.2	48.3					
3			377.8	142.8						23.8	12.4	
4		164.0	577.0			260.3		13.8	24.9			53.8
5					315.6			13.0			12.4	
6		233.2	491.9	186.3							12.4	
7					298,6	507.1						51.7
8		181.8		181.0			32.9	26.8		15.8		
9			298.6			433.9						
10		261.1						122.8	12.7	e te	12.4	56.8
11		• • •			227.4	240.1				Accurate gaugings.	12.4	
12		293.9					51.7			Acg	12.4	
13			255.1	360.4		236.8		63.1		37.6	12.4	
14		719.4			144.2							
15							94.4	105.7	12.1			
16			164.0	249.1								
17												35.6
18		552.0		270.6	371.3	206.2	56.6	24.1		14.2		
19			266.1						13.1			
20		399.1			238.2							
21			227.4					20.7	12.5	18.4		
22						114.6	44.9	76.3				44.9
23		570.8			360.6						24.8	
24				383.7				88.9		29.4	17.3	
25			156.2			52.3	21.5					56.8
26		433.2			316.2						14.2	
27								50.9				
28							16.7		12.2			
29					173.7					12.2		94.4
30			191.8			48.6			32.8		97.5	
31			150.7				15.5	42.2		12.2		
									-			

From the 1st of February to the 11th of May, 1874, we have simply the yield of the river, as no record of the heights of Farm pond was kept or of the condition of the South dam.

No record of heights of the river were kept till February, 1874.

Table showing Daily Yield of Sudbury River and Farm Pond during 1875, in cubic feet per second.

DAY.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1		11.3	626.1	658.7	133.8	35.4	39.4	11.1	12.4	21.6	130.6	149.6
2	12.4	13.5	524.1	922.6	147.0	41.1	32.6	13.8	12.4	36.3	103.8	104.4
3		31.4	213.2	830.0	154.1	34.0	32.2	39.7	19.1	20.9	96.7	78.0
4		81.4	79.5	891.4	149.0	29.4	18.6	63.3	18.7	14.7	88.3	60.6
5	13.0	95.0	53.8	1379.9	133.2	31.2	23.3	60.8	16.9	19.3	84.0	45.0
6	13.0	77.8	51.4	847.8	137.1	20.9	112.0	63.0	19.6	27.4	68.2	84.6
7		54.0	53.8	500.0	304.8	39.0	160.4	53.2	14.7	131.8	41.0	83.7
8		38.2	41.0	348.1	371.9	47.3	121.0	38.7	23.2	394.0	61.7	75.3
9		28.1	46.7	368.0	303,2	84.2	60.2	37.3	18.7	219.2	49.0	73.8
10		35.1	45.0	154.4	284.0	286.2	41.6	37.6	10.7	143.1	116.8	81.7
11		87.1	37.7	166.4	218.1	305.1	27.7	34.0	17.6	135.8	319.0	77.0
12		80.6	122.4	166.3	184.1	239.8	36.0	38,5	13.0	130.4	274.4	65.9
13		64.0	90.0	144.9	140.8	159.2	29.4	33.1	13.0	98.4	229.7	79.3
14	day.	50.4	71.9	100.7	111.4	133.3	30.8	29.8	17.8	69.4	147.1	66.2
15	r da	40.1	145.9	201.1	116.0	102.1	31.2	20.7	15.8	44.1	161.7	58.9
16	s per	31.6	412.7	293.9	102.1	73.6	26.8	21.5	22.3	72.5	151.9	50.1
17	gallons	30.2	464.7	431.6	125.3	61.4	24.1	23,3	67.8	66.4	195.4	55.5
18	90 gs	26.8	418.0	374.4	100.6	60.2	24.9	46.2	63.9	70.8	150.4	46.7
19	00,00	26.8	286.3	309.4	100.6	317.7	25.4	112.6	25.5	85.8	159.2	28.2
20	8,00	27.1	235.9	239.8	123.8	247.5	23.5	130.1	48.6	58.8	136.4	32.6
21		21.8	187.6	204.2	131.5	194,3	25.8	128.4	33.7	53.2	113.1	48.4
22		23.0	130.7	208.2	125.3	133.8	25.8	62.3	41.9	38.7	112.5	57.9
23	12.4	91.7	86.6	189.2	116.0	102.3	32.6	69.6	28.9	37.6	110.0	65.9
24		294.1	74.3	174.5	111.4	73.8	40.2	69.9	25.0	24.3	232.4	61.4
25		965.8	74.1	162.4	100.6	61.7	28.4	58.3	26.7	36.2	224.6	58.6
26		1500.7	84.8	162.4	103.6	47.6	27.7	40.5	15.8	31.7	197.5	41.3
27		742.6	111.4	169.4	89.7	34.0	27.5	41.1	28.2	47.2	248.9	114.0
28		469.7	163.7	131.3	80.4	54.7	28.2	40.7	25.5	50.4	227.2	98.2
29			232.5	144.7	54.1	45.6	16.9	22.7	28.2	42.7	257.1	71.5
30			355.5	131.3	38.7	42.2	12.4	18.9	22.7	51.8	210.8	75.0
31			461.0		37.1		11.6	14.7		134.6	• • •	87.4
Average.	12.4	180.0	193.0	366.8	142.9	104.6	38.7	47.6	24.9	77.7	156.6	70.2

Table showing Daily Yield of Sudbury River and Farm Pond during 1876, in cubic feet per second.

DAY.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	95.3	65.0	67.6	401.7	170.8	30.3	16.2	395.7	11.3			
2	97.0	104.1	72.5	352.5	149.1	35.4	9.0	219.3	18.3		•	
3	108.0	98.2	64.0	289.6	132.9	31.6	13.3	146.2			. 1	
4	77.2	77.0	69.2	676.0	128.2	27.6	7.1	90.5				
5	64.5	56.8	54.9	985.4	132.1	52.4	12.2	63.4				
6	73.2	56.9	16.2	966.4	136.4	56.5	15.8	46.2				
7	64.5	240.4	217.3	911.3	137.5	43.8	7.3	53.5				
8	72 5	234.5	235.3	868.1	147.6	41.0	7.3	42.4	9.9			
9	82.4	157.5	198.8	709.3	182.8	37.6	7.3	35.1	9.9			
10	129.5	144.6	224.3	568.5	277.2	34.5	7.4	28.2	7.3			
11	117.6	147.7	173.7	457.4	293.0	16.7	7.1	25.7	16.5			
12	86.9	272.4	143.5	416.4	247.8	36.5	13.0	20.6	10.5			
13	60.8	197.1	147.4	375.6	205.4	28.2	10.8	15.5	11.3			
14	57.7	196.2	146.6	342.8	181.8	27.1	12.0	21.6	8.0			
15	48.4	432.5	147.0	324.9	156.4	28.4	14.5	15.9	6.8			
16	42.2	493.3	133.2	304.6	134.9	25.7	7.4	22.0	9.6			
17	58.6	370.7	125.6	323.5	118.8	13.9	14.1	26.6	20.7			
18	58.6	278.6	121.7	284.2	116.3	11.0	8.5	30.5	73.6			
19	107.4	203.9	117.6	249.2	134.7	11.1	6.5	20.6	51.4			
20	98.7	160.1	119.7	236.7	108.0	15.5	7.9	12.5	35.3			
21	71.5	129.8	1227.2	239.9	99.1	21.8	6.0	25.2	41.3			
22	66.4	124.1	1836.3	221.7	99.9	25.1	11.8	21.5	38.4			
23	65.0	106.3	855.5	198.9	138.6	26.3	22.4	20.7				
24	67.7	73.9	505.6	189.5	125.9	17.0	15.0	26.0				
25	52.0	73.0	404.1	184.1	94.4	12.5	25.7	18.9				
26	50.3	71.5	3217.8	175.0	79.7	23.0	23.7	14.7				
27	50.1	59.7	2476.7	153.3	78.9	17.0	21.0	8.5				
28	65.7	70.2	1149.4	148.7	61.9	26.0	15,3	13.6				
29	113.2	75.5	786.8	164.4	72.7	10.5	17.3	11.4				
30	109.7		792.8	161.7	44.9	16.4	33.6	7.4				
31	85.5		590.4		57.1		285.9	11.1				
Average.	77.4	164.5	633.5	396.0	136.9	26.7	22.0	48.7				
							1		-		h	

Q. (By Mr. Child.) You spoke of a freshet that you could not measure; when was that freshet?

A. It was at the very end of March or the beginning of April.

Q. Not the July freshet which has been talked about?

A. No, sir. Q. What is that table?

A. Table marked "A. F. 2" is explanatory of that red line, represented on Mr. Herschel's profile. It represents in figures the flow through the temporary ditch in cubic feet per second; the rate of storage in Farm pond and above the city dam; then another column shows on account of diversion and storage, the amount to be subtracted from the natural rate of river; another column gives the natural rate of the yield of river in cubic feet per second: and the last column, which is a subtraction from some of the other figures, gives, consequently, the number of cubic feet per second, flowing down the river without any diversion.

"A. F. 2." Sudbury River Gauging at Framingham, Mass., July 6 to Sept. 25, 1876.

	DATE.	Flow through temporary ditch in cubic feet per second.	Rate of storage in Farm pond, and above dam, cubic feet per second.	Amount to be subtracted from natural rate of river or on account of storage and diversion.	Natural rate of yield of river, cubic feet per second.	Cubic feet per second flowing down the river.
July	6		0.4	0.4	15.8	16.2
66	7		0.4	0.4	7.3	7.7
66	8		4.1	4.1	7.3	3.2
66	9		5.0	5.0	7.3	2.3
66	10		5.1	5.1	7.4	2.3
66	11		4.8	4.8	7.1	2.3
44	12		10.7	10.7	13.0	2.3
"	13		8.5	8.5	10.8	2.3
"	14		9.7	9.7	12.0	2.3
"	15		12.2	12.2	14.5	2.3
66	16		5.1	5.1	7.4	2.3
"	17		11.8	11.8	14.1	2.3
"	18		6.2	6.2	8.5	2.3
"	19		4.2	4.2	6.5	2.3
"	20		5.6	5.6	7.9	2.3
66	21		3.7	3.7	6.0	2,3

Sudbury River Gauging, etc. — Continued.

	Date.	Flow through temporary ditch in cubic feet per second.	Rate of storage in Farm pond, and above dam, cubic feet per second.	Amount to be subtracted from natural rate of river on account of storage and diversion.	Natural rate of yield of river, cubic feet per second.	Cubic feet per second flowing down the river.
July	22		9.5	9.5	11.8	2.3
"	23		19.8	19.8	22.4	2.6
"	24	9.8	2.9	12.7	15.0	2.3
"	25	33.1	9.7	23.4	25.7	2.3
"	26	32.2	10.8	21.4	23.7	2.3
"	27	34.9	16.2	18.7	21.0	2.3
66	28	33.9	20.9	13.0	15.3	2.3
66	29	29.7	14.7	15.0	17.3	2.3
66	30	25.6	5.7	31.3	33.6	2.3
44	31	31.9	12.4	44.3	285.9	241.6
Aug.	1	30.7	1.2	31.9	395.7	363.8
"	2	30.9	0.8	31.7	219.3	187.6
66	3	33.3	0.5	33.8	146.2	112.4
"	4	31.8	5.3	37.1	90.5	53.4
"	5	34.3	6.8	41.1	63.4	22,3
44	6	34.1	5.4	39.5	46.2	6.7
"	7	38.5	3,9	42.4	53.5	11.1
"	8	36.9	1.5	38.4	42.4	4.0
"	9	36.0	3.2	32.8	35.1	2.3
66	10	35.5	9.6	25.9	28.2	2.3
44	11	33.9	10.5	23.4	25.7	2.3
"	12	30.7	12.4	18.3	20.6	2.3
"	13	28.4	15.2	13.2	15.5	2.3
"	14	25.8	6.5	19.3	21.6	2.3
"	15	24.6	11.0	13.6	15.9	2.3
44	16	22.9	3.2	19.7	22.0	2.3
"	17	22.6	1.7	24.3	26.6	2.3
"	18	22.5	5.7	28.2	30.5	2.3
"	19	22.6	4.3	18.3	20.6	2.3
44	20	20.4	10.2	10.2	12.5	2.3
46	21	18.7	4.2	22.9	25.2	2.3
66	22	19.5	0.3	19.2	21.5	2.3
66	23	19.3	0.9	18.4	20.7	2.3

Sudbury River Gauging, etc. — Concluded. •

	Date.	Flow through temporary ditch in cubic feet per second.	Rate of storage in Farm pond, and above dam, cubic feet per second.	Amount to be substracted from natural rate of river on account of storage and diversion.	Natural rate of yield of river, cubic feet per second.	Cubic feet per second flowing down the river.
Aug.	24	18.9	4.8	23.7	26.0	2,3.
"	25	18.4	1.8	16.6	18,9	2.3
"	26	18.4	6.0	12.4	14.7	2.3
46	27	17.3	11.1	6.2	8.5	2.3
66	28	16.4	5.1	11.3	13.6	2,3
"	29	15.1	6.0	9.1	11.4	2.3
66	30	13.6	8.5	5.1	7.4	.2.3
"	31	13.1	4.3	8.8	11.1	2.3
Sept.	1	13.2	4.2	9.0	11.3	2.3
"	2	7.8	8.2	16.0	18.3	2.3
"	3		0.4	0.4	1.9	2.3
"	4		2.5	2.5	4.8	2.3
66	5		3.4	3.4	5.7	2.3
66	6		2.9	2.9	5.2	2.3
66	7		3,9	3.9	6.2	2.3
66	8		7.6	7.6	9.9	2.3
"	9	11.2	3.6	7.6	9.9	2.3
66	10	16.4	11.4	5.0	7.3	2.3
66	11	14.5	0.3	14.2	16.5	2.3
66	12	13.9	5.7	8.2	10.5	2.3
66	13	13.0	4.0	9.0	11.3	2.3
66	14	12.7	7.0	5.7	8.0	2.3
66	15	12.4	7.9	4.5	6.8	2.3
"	16	7.9	0.6	7.3	9.6	2.3
"	17		18.4	18.4	20.7	2.3
"	18		4.6	4.6	73.6	69,0
66	19		2.1	2.1	51.4	49.3
66	20		0.5	0.5	35.3	34.8
66	21				41.3	41.3
66	22		0.5	0.5	38.4	37.9
66	23		14.3	14.3	23.4	9.1
66	24		3.9	3.9	10.1	6.2

Q. The column marked in this way, "Amount to be subtracted from the natural rate of river on account of storage and diversion," that represents the space between the black and the red line?

A. Yes, sir.

Q. What part of the flow of the Concord river is represented by the yellow line here, in the summer months?

A. I don't think I understand your question.

Q. What part of the flow of the Concord river does the Sudbury river comprise in the summer months, as represented by this yellow

line on this plan?

A. I have not calculated it; but, looking at our profile and knowing the scale of that profile, I should say something like one-ninth or one-tenth. It is a matter which can be calculated from this

profile accurately.

Mr. Child. On the tables which have been put in here this morning it is estimated exactly, and the results of these tables can be calculated upon them; by which it appears that the flow of the Sudbury river at this time was less than one-tenth, as Mr. Fteley represents it by calculating the profile.

Mr. Shattuck. Do you mean the average? Mr. Child. The average of the summer months.

Q. (By Mr. Child.) You can tell each day, can you not?

A. Yes, sir.

Q. Take the 26th of July, 1876. You compare the yellow line with the red line, you understand?

A. Yes, sir. I see that the black line here indicates 151, as

represented by the scale.

Q. You don't understand the question I asked you. I want to know the proportion the flow of the Sudbury river bears to the total flow that it would be if there was no diversion between the red line and the yellow?

Mr. Shattuck. That is, assuming that all went there in exactly

three days after it started?

Mr. CHILD. Yes.

A. For that date it represents seven and seven-tenths.

Commissioner Russell. That is, it represents ten seventy-sevenths of the whole flow?

Mr. Shattuck. No. It represents one-seventh and seventenths.

Commissioner Russell. Well, that is ten seventy-sevenths, is not it?

Commissioner Francis. Yes, sir.

Witness. I will take the 26th of August, if you please. The number of cubic feet here is 154, and the Sudbury river is 14 cubic feet.

Q. (By Mr. Child.) Now take another day. Take the day when it is the smallest proportion, if you can put your finger on it?

A. The smallest proportion must be in the freshet.

- Q. Well, take the highest day in the freshet in the Sudbury river?
 - A. August 1st, Sudbury gives here 396.

Q. And what does the red line, the whole, give that same day?

A. That very same day corresponds to 570.

- Q. Now take the highest amount of the Concord?
- A. The highest amount of the Concord, according to this scale, was 780 cubic feet.

Q. What day was that?

A. That was the 3d of August. Q. And what was the Sudbury?

A. The Suabury, on the 3d of August, was 147.

Q. From the average through the summer months, according to this plan, you judge that it is between one-ninth and one-tenth of the aggregate of Sudbury of the Concord?

A. Yes; it seems to me from that profile it is so, and the tables

which have been submitted will show it exactly.

Q. In the different years you have known the Sudbury river,

how has this comparison been?

- A. I cannot make the comparison, because I was not acquainted with the flow of the Concord river.
- Q. From your observation of the Sudbury river, how does it compare in these two years with this year?

A. In 1875, the flow was higher; in 1874, it was lower and the

dry season longer.

Q. Now, from your knowledge of the whole question, in your opinion what is the aggregate of the Concord river and the Sudbury river, and what proportion do they bear to each other? From what you do know, can you judge?

A. I don't know exactly what the question is.

Q. From what you know of the whole subject, the Concord and the Sudbury river measurements, etc., whether you can give an opinion as to the proportion the Sudbury bears to the Concord river in the summer months, during the last four years, during the

time you have known it?

A. As far as the comparison between the Sudbury and the Concord river is concerned, I don't know anything beyond that profile, and all I can show is what is shown by the figures; but so long as you put the question in such a manner, I should say this: that in the summer months generally the Sudbury would show less than its proportion of water-shed would make anybody suppose.

Q. To what extent?

A. I cannot say.Q. It is the habit of engineers, is it not, to ascertain or estimate

A. Yes, sir.

Q. And will you explain why the flow of the Sudbury, in this instance, does not compare with the water-shed, and what parts of

the year?

A. I should say that the Sudbury is in the same condition as all rivers of that size are, as compared with a river of the size of the Concord; and as a general thing all rivers having about the same nature of water-shed, that would be the general result, so that the Sudbury river makes no exception in that case.

Q. Can you explain what the reason is?

the flow of the river by the water-shed?

A. This is to a large extent a question of fact. If you, for instance, in a dry month, examine streams running in such condition as the Sudbury does, or smaller streams, generally you find that the smaller they are the less water they will run in the summer time. Now, for instance, you go to the very small feeders of the Sudbury, and I don't doubt that there are some now that are entirely dry although they carry some water during the wet season, and if you go to the larger streams you will find a flow that will not be very considerable; but by this gauging you can see that the Concord river, for instance, shows a larger flow, comparatively, to its water-shed; and therefore I say it is a question of fact. Now there may be some way to explain it, and it is the general belief that the water—

Mr. Shattuck. Is that competent?

Q. (By Mr. Child.) General belief among engineers, I suppose you mean?

A. Yes, sir.

Mr. Shattuck. Any knowledge on this subject that is recognized as scientific knowledge would perhaps be competent to testify, but otherwise it would not.

Commissioner Russell. The witness has stated that the fact as observed is so; then he is asked to explain the fact. The question is, if there is any known explanation among scientific men, and if so to state what it is.

Q. (By Mr. Child.) Go on, sir.

A. I should say that it seems to me that the whole amount of water-shed and the strata of the ground below the surface form a very large reservoir of water generally, and it is natural, in a dry season of the year, when these small channels are not so full of water, to find more water come out from the streams which run in low ground than from the streams which run in high ground.

Q. How is it a fair mode of estimating the production of any stream to average the rainfall over a period of either a week or a

month or a year?

A. Well, the larger number of years that you take the better the estimate will be. It is very often that engineers are obliged to base themselves on the rainfall of a few years when they cannot get some more records; and as to the rainfall of a particular week or day, I don't suppose that would be of any value.

Q. Suppose, for instance, that the rainfall during July and August, as indicated on this map, was averaged over the whole, would that average be any criterion to jude of the amount of

power it would furnish the mills upon the Concord river?

A. You mean, if the rainfall during those periods from July to

September was applied to the rest of the year?

Q. No, sir. In the first place, during that month, would it furnish any criterion of the power which was furnished to the mills?

A. No, sir; I think not.

Q. And if the average for a month were taken, will it not include the water that could not be stored or used, and run over the dams to waste during this heavy freshet, for instance?

A. Yes, sir.

Q. Have you gauged other streams besides the Sudbury?

A. Yes, sir. Q. How many?

A. The last gaugings I made, and during the time I was engaged on these gaugings, was of the Abajonna river, and of the Mystic pond; whether it was before that or after I don't recollect exactly, but the same year I gauged a stream running out of Flax pond, in Lynn, for some investigations made there; and previous to that time I made some gaugings —. You asked me and I supposed it was gaugings of a natural stream.

Q. Yes, sir, of a natural stream?

A. I recollect having guaged in 1868, I believe, a canal in Trenton, that distributes power to the various mills, so as to make a distribution of it.

Q. Then you are familiar with the flow of the rivers in this part

of the country, are you?

A. Yes; but I limit the portion to where I have actually made the gaugings, that is in Lynn and north of Charlestown, and then Sudbury river.

Q. What is the character of the Sudbury river, as a river which furnishes steady power for the use of mills, whether it is a quick

river or not?

A. I was just going to say that it is called a quick river. When the ground is tolerably saturated, and when we have rain, it shows very quickly and passes very quickly.

Q. (By Mr. Butler.) Which is the better quality of water for the purposes of the City of Boston, which is for domestic pur-

poses - Lake Cochituate or the Sudbury river?

A. I should say Lake Cochituate, because Sudbury river has no storage reservoir where the water can stand now; at present I should say Lake Cochituate.

Q. Do you know the extent to which it is proposed to make

storage basins in the Sudbury river?

A. Yes, sir.

- Q. Suppose storage basins are to be made and put up next year, dams closed next year, how would be the character of the water found in these storage basins as compared with that in Lake Cochituate?
- A. The water from Lake Cochituate would be better, because the water will flow some extensive meadows for a few years to come, and I suppose the water will not be quite so pure as a water which is stored in a lake which has existed for a long time.
- Q. If the water is properly used by the city, whether it would not be the better way to use all Lake Cochituate water for a series of years in their supply, before drawing from the Sudbury?

A. Yes, I should say it would be better to use Lake Cochituate

before drawing from the Sudbury.

Q. Whether it would not be the best manner of using the water from the two sources of the supply, the Cochituate and the Sud-

bury, to let in as little of the Sudbury as possible for a series of years?

Mr. Shattuck. I object.

Mr. Butler. You are to estimate the damages by the The city has now a supply from the Cochituate which is equal to twenty million gallons a day. It has that supply, a permanent supply, of a better quality of water, we will assume, for the purposes of the argument. Suppose that I show, as I proposed, by this witness, that for the next twenty years, taking the growth of the city into consideration, seven million of gallons only will be needed from the Sudbury, or will be taken from the Sudbury, and that the city will require no more than that. Suppose, then, the reservoirs being made and a large storage effected, which will be let down the Sudbury into the Concord, that taking will not make any appreciable "withdrawal"—that is the word of the statute — of the water for a series of years, say twenty years. I don't mean to indicate at all what it will be, but I am only illustrating it: say twenty years. Are you then going to give a sum in damages to-day, to compensate for taking all of Sudbury river to-day and give an amount of money which will compensate for what is done to-day, when what is supposed to be done to-day is actually not done until twenty years hence? I don't think any state of the law would require that gross injustice to be done. That is to say, I don't think mill-owners on the streams ought to enjoy the water for twenty years, and enjoy the income of the worth of that water for twenty years. I don't think that is a proper construction of the statute; therefore I offer to show that for a long series of years, for the purposes of the city, there will not be any water actually withdrawn from the Sudbury, and that statute being the actual withdrawal, that they are not to have their damages till the actual withdrawal, which, it seems to me, has been made to meet this very case. For instance, take what must be the fact, that dam will not be shut up until a year from now, so that no water will actually be withdrawn until a year from now, except the modicum of water which -

Mr. Shattuck. Has not it all been drawn for some months?

Mr. Butler. Except the modicum of water which has been drawn for a short period. Assume that there are fifty cubic feet per second of the whole Sudbury river in its flow, during the daytime, — and we shall continue to withdraw only five for a period of twenty years, — are the mill-owners to have the pay for the forty-five cubic feet, and have it too?

I agree we are to pay for the whole Sudbury river, when we withdraw it. It is said that there can be but one estimate of damages, and therefore that that damage must be estimated now, and that the taking, by filing the paper, is the actual taking for which we are responsible. I agree to that—that we take it theoretically now and are being assessed for damages now. Then the question recurs to us, Mr. Chairman, what are those damages? We are not to pay money theoretically, we are to pay money actually; we are not to pay money damnum absque injuria, but for a loss with an injury, and that is the only sensible rule; therefore this testimony is competent, tending to show the fact on which that rule must be based.

[Adjourned to Monday, October 16th, at 1.30 P.M.]

Monday, October 16th, 1876.

The commissioners met at $1\frac{1}{2}$ o'clock.

Mr. Butler. I want to call the attention of the commissioners to the peculiar wording of the first section of the Act of 1846: "The City of Boston shall, within sixty days from the time they shall take any lands, or ponds, or streams of water for the purposes of this act, file in the office of the Registry of Deeds for the county where they are situate, a description of the lands, ponds, or streams of water so taken, as certain, as is required in a common conveyance of lands, and a statement of the purpose for which taken, which said description and statement shall be signed by the said mayor." I will put in the whole of that act, chapter 167 of the Act of 1846.

[See front of book, page v.]

I will also put in the Act of 1872, chapter 177, passed April 8th, 1872.

[See front of book, page xi.]

Commissioner Russell. Will you put the question again, Gen. Butler, the admissibility of which was under discussion

at the close of the last hearing?

Mr. Butler. I offer to show, by this witness [Mr. Fteley, that in the natural, and economical, and proper use of the water by the city, in the storage they make of the Sudbury river, they will not practically draw any water from the river for a long series of years. That will be the scope of the testimony I shall offer. And, first, for this reason: he has already testified that the water of Cochituate lake is purer, and must be for a series of years, than the water of Sudbury river, because the water of Sudbury river has got to be reservoired up, and the decayed vegetation in the bed of the stream gotten rid of; therefore, the city will only take out as much of the Sudbury-river water as, supplemented to the Cochituate water, will make up a sufficient amount for the use of the city. That use, I say, would be the only proper and economical use of the water that any skilled man would make; and it is not to be presumed that the city will do anything that good skill and judgment would not require; and, therefore, I say, that as the water is not

to be paid for until it is withdrawn, although you may be satisfied that the taking is the filing of the paper (which I deny, because the statute says expressly that the paper shall not be filed until sixty days after the taking), all that can be referred to here is what is actually withdrawn at the time of the petition. And this is for the benefit of the millowners; for they have the right all the time, when a greater quantity is withdrawn, to make their petition within three years. But, assuming that that is not so, then we come to the question of damages: what is the actual damage to the parties? Why, they are not damaged until the water is withdrawn. It is not like the case of a highway, where the laying out segregates the land, and the damages are for the taking for all time. The question is: what damages should be given for the water taken? I will illustrate it by this: Suppose you should be satisfied that Lake Cochituate, with the addition of five feet from Sudbury river, would supply the City of Boston for the next twenty years. Assume that that fact was impressed upon your mind so that you should not doubt it. Then suppose that you should come to the conclusion that there were fifty cubic feet per second in Sudbury river. Then, I say, it would be a great wrong done to assess damages for taking forty-five cubic feet twenty years before it was taken, because the sum paid for that, put at interest during that twenty years, would double and quadruple, at any fair rate of investment. It is a practical question, addressed to the practical judgment of practical men. It is not a mere question of theoretical damages, it is an actual damage; and the whole scope of the act is, that damages are to be paid for the water withdrawn. A different rule is established in this very act for taking land and taking water. It provides in the first section, as I have just read, that "the City of Boston shall, within sixty days from the time they shall take any lands, or ponds, or streams of water, for the purposes of this act, file a description of the lands, ponds, or streams of water so taken." That is, within sixty days from the time they shall take. Then, "if the owner of any land, or water rights, which shall be taken as aforesaid, or other person who shall sustain damage as aforesaid, shall not agree upon the damages to be paid therefor, he may apply by petition for the assessment of his damages at any time within three years from the taking of the said land, water, or water-rights as aforesaid, and not afterwards." That applies to all. Now, then, we come to the eighth section, which is the limitation: "No application shall be made to the Court for assessment of damages for the taking of any water rights" [not for streams and ponds,

but for water-rights] "until the water shall be actually withdrawn, or diverted by the said city under the authority of this act; and any person or corporation, whose water-rights may be thus taken and affected, may make his application aforesaid at any time within three years from the time when the water shall be first actually withdrawn or diverted as aforesaid."

Then there was a new act, the Act of 1849, which is only of value because it shows the intent of the legislature. Section 5 of the Act of 1872 provides, that "the City of Boston shall be liable to pay all damages," etc., "and all persons claiming damages shall have all the rights, immunities, and remedies, and be subject to all the duties, liabilities, and regulations which are provided in the 167th chapter of the Acts of the year 1846, and the 316th chapter of the Acts of the year 1850." The Act of 1850 was simply a tender act. The Act of 1849 provides for certain rights for the city, which I will read to you.

Commissioner Russell. Has that act anything to do with

the Act of 1846, or the Act of 1872?

Mr. Butler. Yes, sir. "An Act in addition to 'An Act for supplying the City of Boston with pure water.'" The only value of this act, perhaps, is to show, as I have said,

the intent of the legislature:—

"Whenever any damage shall have been sustained by any persons in their property, by the taking of any land, water, or water-rights, or by the constructing of any aqueducts, reservoirs, or other works, for the purposes of this act, and of the act to which this is in addition, and such persons shall neglect to institute proceedings against the City of Boston, according to the provisions of the said act, for the space of five months, it shall be lawful for the City of Boston to commence such proceedings, which shall go on and be determined in the same manner as if commenced by the persons who shall have sustained such damage; and if such persons on receiving due notice, shall not come in and prosecute the proceedings so instituted, judgment shall be entered against them, and they shall be forever barred from recovering any damages under said act."

I refer to this act only to show that the city had certain rights, commencing at the same time with the parties. That is all the value I put upon that act. If those parties will not go forward the city pay.

not go forward, the city may.

Commissioner Russell. Is that act applicable to the

taking under the Act of 1872?

Mr. Butler. I think it is, but whether it is or not, is of no consequence in this case; I am only citing it now to show

the intent of the legislature,—that everything shall date from the actual withdrawal of the water.

Mr. Shattuck. I do not think I have anything to add to what I said in my opening. The act requires the city to take all the water of Sudbury river, and the limitation of time for bringing the petition is determined by the time of the actual taking. Nothing else is determined by it.

Mr. Butler. That leaves us right where we stood before. Very oracular; but I do not see that that changes matters

at all.

Commissioner Russell. I should like to hear you, Mr. Shattuck, as to your position that the act "requires" the city to take all the water of Sudbury river.

Mr. Storey. Is not the question now on the admissi-

bility of the testimony offered by General Butler?

Commissioner Russell. The question now is as to the competency of the question put to the witness. That is the only matter directly before us; but General Butler has intimated that he proposes by other interrogatories to raise the whole question, and perhaps it may as well be considered now.

Mr. Shattuck. The City of Boston, of course, had no authority to take property except under the act, and in accordance with the terms of the act, and they must pursue the act strictly. The very first sentence is, that the City of Boston is authorized to take all the water in Sudbury river.

Mr. Butler. That is the very word, — "authorized."

Mr. Shattuck. They have proceeded, and in terms taken all the water in Sudbury river. It may not be necessary now to discuss the question whether they were bound to do it or not, although it has always seemed to me clear that they were bound to do it; that that was the purpose of the act, in order to avoid any controversy about what was taken. It is difficult, as I said in my opening, to determine under any circumstances the damage done by taking water, and in order that there should be as much certainty as was practicable, the legislature made the terms of the act authorizing the taking such that the city have no authority to take a part. They have no authority to take some of the water when they are authorized to take the whole of it. I do not see how I can more clearly state the argument in favor of that theory than to read the act; but, as I have already said, they have proceeded to take the whole of it, and we are assessing damages now once for all. That point has been fully argued by some of the gentlemen who have addressed the commissioners in the other cases, and I have nothing to say upon that. They have taken the water, and therefore, as

there is compensation to be had only once, we must have full compensation. Then they are not to pay us for what is actually taken, but they are to pay us damages caused by the taking of water-rights. It is precisely like the case of a paper taking of land for the building of a highway. The parties enter, lay out the highway on paper, and the question of damages is determined with reference to the use of the property whenever it may be made. That use may change. The use may be greater at one time than another. Originally, as the law stood before the case in 1st Metcalf, the damage included all changes in the grade of the road for all time. The real damage might not occur for a hundred years, but it was paid for at the time of the paper taking.

In this case they take the right to all the water in Sudbury river, and we claim that the owner of any land, water, or water-rights, had a right to have the Sudbury river flow in its natural channel, and every mill-owner had a right to have it flow on the line on which he had that right. "And if the owner of any land, water, or water-rights which shall be taken as aforesaid, or other person who shall sustain damage as aforesaid, shall not agree upon the damages to be paid therefor, he may apply by petition for the assessment of his damages at any time within three years from the taking of the said land, water, or water-rights as aforesaid, and not afterwards." — (Section 6, chapter 167 of the Acts of 1846.) "No application shall be made to the Court for the assess ment of damages for the taking of any water-rights until the water shall be actually withdrawn or diverted by the said city under the authority of this act." — (Section 8.) That does not mean that all the water shall be diverted. the provision, as suggested by Judge Abbott in the Ipswich case, where the Court decided that there should be only one compensation for the water. The provision in the Act of 1872 is: "The City of Boston is hereby authorized by and through the agency of the Cochituate Water Board to take, hold, and convey into and through said city all the water of Sudbury river." Now, is there any authority for them to take any less than that? And as they have taken the whole of the water-rights, it is very clear that they must pay for them. I have discussed this question as fully as I care to in the opening, and I may wish to add something in the closing argument; but I do not care to say anything more now.

Mr. Storey. As I understand it, the counsel for the city offer to show by this witness, that although the City of Boston have taken the whole of the water of Sudbury river by their written taking, which has been recorded in the Registry of

Deeds, they will not have occasion to use for the needs of the City of Boston the whole of the water for some twenty years, and therefore that we are to be paid damages, not for what they have taken by their paper taking, but for what they are actually likely to use during the next twenty years. I do not perhaps understand precisely the proposition of the defendant's counsel. I have stated his claim as I understand it.

Commissioner Russell. As I understand his proposition, it is not that. It is not that you are to be paid only for what is to be used in the next twenty years, but that you are to be paid now only the damages which will be sustained by the use of the water twenty years hence. It is exactly the converse of the proposition that you are to be paid only for the water used in the next twenty years.

Mr. Storey. In other words, they are to pay to-day a sum of money which, if put at interest now, twenty years hence will amount to the whole value of the water of the

Sudbury river.

Mr. Butler. Oh, no; I only used twenty years as an illustration. I do not think it will be needed for sixty years. I have gone into a little calculation, and I do not think it

will be wanted for sixty years.

Mr. Storey. I use twenty years in the same sense you There are only two aspects in which that evidence can be competent. It can be competent for the purpose of showing that the city have not yet taken the water, and therefore our petition under the statute is prematurely filed; or it may be competent for the purpose of showing how much water they have taken, and therefore how large our damages ought to be. On the first quesion the undisputed evidence in the case shows that they have taken all the In that connection, I desire to water of Sudbury river. call the commissioners' attention to the precise language of the record. On the 17th page of the record is the written taking which was filed in the Registry of Deeds, in which it is set forth that, "the City of Boston, by the Cochituate Water Board, duly appointed and constituted, and by virtue of the power and authority in said act given, and in part execution of the same, have taken, and by these presents do take, for the sole use and benefit of the said City of Boston, all the water of Sudbury river, so called, at and above the dam built by the City of Boston in 1872, five hundred feet more or less below the crossing of the said Sudbury river by the Boston, Clinton and Fitchburg railroad." Then follows a more detailed description of the brooks, ponds, streams, and water-courses. But the language is that the City of Boston,

by a written taking, which they have recorded, take all the water of Sudbury river. Now, in analogy to the provision in the highway act, that after the paper taking has been made, the damages that a man has sustained by the loss of land shall not be paid until the city has actually entered upon the occupation of the property, there is a provision in the Act of 1846 that, "No application shall be made to the Court for the assessment of damages for the taking of any waterrights until the water shall be actually withdrawn or diverted by the said city under the authority of this act; and any person or corporation whose water-rights may be thus taken and affected, may make his application aforesaid at any time within three years from the time when the water shall be first actually withdrawn or diverted as aforesaid." The evidence in the case, the admission of the city, and the evidence which the commissioners obtained from the view, show that a dam has been built across Sudbury river by which all the water has been diverted except the 1,500,000 gallons which by the terms of the act are to be allowed to flow for the purpose of creating a running stream; and therefore, on the question whether our petition is properly here, it is obvious that everything which the act requires has been done. The paper taking has been filed; the whole water has been actually diverted, and I do not understand that it is seriously contended that our petition is prematurely filed.

The thing for which we are to be paid damages is the thing which has been taken, and the thing which has been taken, by the terms of the act, is described in the paper taking which has been made and recorded. It is the damages which we sustain by the taking of that which we are entitled to receive. We are not asking here damages for the diversion from us of so many gallons of water. We are asking damages for the taking of the valuable right to have all the water of Sudbury river flow, as it has been accustomed to flow, past our mill. That right has seen taken; the actual entry has been made; and the right being gone, it makes no difference whether the city of Boston proposes to avail itself of the property which they have taken or not. Suppose, for example, the ordinary highway case. Suppose the City of Boston by a paper taking takes ten feet off of the front of my estate to widen the street. Suppose the city enters the estate and takes out one window. They have made an entry, my petition can be filed, and I can obtain all my damages. If the whole front of my building remains otherwise undisturbed for ten years, it is their fault, not mine; and if they do not choose to use the property they have taken from me, that does not affect the question of dam-

Now, in this case, they have taken the water of Sudbury river. They have actually diverted that water to their advantage, and they propose to continue to divert it whenever necessity requires. The right which we have to have that water flow is gone, and we are entitled to recover damages for the value of that right. If the construction which General Butler claims is correct, it would seem that if they take 200 gallons to-day, we must bring our action to-day for that; and if they take 500 gallons to-morrow, we must bring our action for that, and so on for the next twenty years. He does not undertake to show what the city of Boston have done, but he asks the witness his opinion as to what a prudent city, supposing it grows no faster in the next twenty years than it has in the last, would be likely to do during that period. Such evidence seems to me so grossly immaterial that I hardly care to trouble the commissioners with any further argument.

Mr. Butler. There is nothing, it seems to me, so dangerous in discussing questions as mere analogies. I think we are to look, therefore, precisely to the case at bar to see what is authorized to be done, what has been done, and what remedies are provided for what has been done. It is insisted by my brother Shattuck that the city must take all the water. Upon the language of the act, if that is to be insisted upon, then, they must convey it into the city, because the same act says that they are authorized "to take all the water of Sudbury river, and hold it, and convey it to, into, and through said city." If they do not do that, then they do not pursue their authority. That I hardly think will do as a construc-

tion

Now, then, the act gives them the authority to take the water; but as water differs from land, if they do not take it, and actually withdraw it, the party below is not injured. The statute has provided expressly that no damages shall be assessed except for water actually withdrawn. I think I am correct in that.

Commissioner Russell. There is no such phraseology. Mr. Butler. No, sir. The phraseology is before you. The phraseology is, "No application shall be made until the

The phraseology is, "No application shall be made until the water is withdrawn." You cannot assess damages without an application. Very well. Then, if no application be made until the water is withdrawn, what is that application for? Why, it is for the damage sustained. How? Not by any technical taking, but by the actual withdrawal of the water. It is agreed that the water must actually be withdrawn, some of the water, before they can maintain their application for damages. Now, what are they going to have damages for?

Why, it is for injury done. That injury is the withdrawal of the water; but they say, by analogy to the highway act, they are to have all their damages assessed when one drop of water is withdrawn, although another one never is to be withdrawn; or, in other words, that they should have, as was the case under the old highway act, where a road was laid out over a man's land, and discontinued the next day, he had the right to all his damages, if the road was to remain forever discontinued. Now, suppose that under the old highway act, it said, "the County Commissioners may take any land for a road that they choose, but there shall be no damages allowed until that land is actually used," how would it be then? Could they have any damages until it was actually used, and could they have damages except for the use of it? Are they going to assume that some years hence it will be used?

Now, won't you take into consideration this fact? Here was a great public work for taking water. Everybody understands that the water withdrawn is measured every day, and is to be measured every day, is capable of being measured every day, so that, instead of going into calculations of water-sheds, and going into calculations of evaporation, basins, and comparisons, and all the uncertainties, every man, if my proposition is correct, can know exactly how much is taken, and have his damages for exactly what he has lost.

Mr. Shattuck. Do you mean to say that we are to have our damages from day to day? I want to understand you.

Mr. Butler. I will try to make what I mean plain to everybody's capacity. I may mean wrong, but it is not one of my faults that I cannot state what I do mean. I am certain about that. I by no means say that they are to have an action every day; the thing would be preposterous. But once in three years they can have an action for every drop of water that has been taken. That is my proposition, and that amount, by a public officer, acting for the public, is measured, in practice, and must be measured, in fact, so that they can have every element of their damage ascertained, and that gives force to the words, "first withdrawn." For instance, at the end of three years from the first withdrawal, it will be known on the day they file their petition just what has been taken, and they get their damages for that, or any intermediate time they choose to begin. Then, if the city draws no more, that ends it. If the city afterwards draws some more water, then that new water is first withdrawn or taken, and then, three years after that, they may file their petition again. That gives them the right to damages for every drop of water which is taken. There is no provision for giving damages for water-rights, as independent from water, because when the act says we are to pay for water-rights, as differing from water actually taken, it says we may take all the water-rights that they have got, or ever can have, and unless we withdraw some portion of that water, they have no claim for damages. They can only get damages for that which is withdrawn.

Mr. Storey. You said there was no provision for the assessment of damages for water-rights. I desire to call your attention to section 8 of the Act of 1846: "No application shall be made to the Court for the assessment of damages for the taking of any water-rights until the water shall be actually withdrawn or diverted."

Mr. Shattuck. What do you say to the Ipswich case?

This case is as near like that as can be.

Mr. Butler. The Ipswich or Wenham case is quite in harmony with all I am saying. In that case, it was not a stream of water that was taken. The city took Wenham lake, and took the land all around it, and this question did not arise. Every drop of water in that lake was actually taken, diverted, and stopped from flowing. Now, if I can go on a little while longer (not to be tedious, for I only desire to indicate my point), this is not a new question to me, because the city of Lowell filed a taking of the whole of Merrimack river. They did not want but about 3,000,000 gallons a day at the outside; but they took the whole of Merrimack river, so far as it appeared, and the claim was raised that the city had got to pay for the whole of Merrimack river. But the good sense of the gentlemen who raised that claim prevented their pressing it, and we made an adjustment directly. I was at that time called upon to see what was the construction of that act, the language of which, so far as it regards damages, was substantially the same as the language of this act. It was damages for the water withdrawn. That is to say, there can be but one exercise of the right to take. When they desire to take the whole water of the river, then they are to pay damages as they withdraw it, and for what they withdraw, because it was not intended that there should be any speculative or theoretical damages. There is no other way to adjust this question, and it has not been decided to the contrary anywhere. The act is sui generis, dealing with the thing itself. Ponds are part of the land; streams are part of the land; they are described. Water-rights are the rights that men have in the streams, not owning the land through their continuous length. That is the difference, as I understand it. For instance, if I have the whole of a stream in my land, I own all that stream of water from its head to its confluence with another stream, subject, of course, to the rights of those below to have the water run. When that is taken from me, there is the end, but the riparian proprietor below, who has the right to have the water run beyond my land, has a right to what? Not to the whole stream which I have, for I have the right to use it, subject to certain restrictions, but to the amount of water diverted, — no more and no less. That is one view of the matter.

Now the other point is this: that we are not to pay damages for water that is not withdrawn until twenty years hence, and that, in considering these damages, it is a necessary element to show whether, according to the usual and ordinary mode of the use of water, any water will be taken for twenty years, or withdrawn within twenty years. Those are the two propositions.

My brother Child suggests a point that I argued to you before, — that you ought, in giving damages, to see what would be the effect of so much capital paid to a man at the present

time for future damages. To get at that element, I think

this testimony is admissible.

The commissioners have con-Commissioner Russell. ferred together upon the question which is now raised, although before we had the full benefit of the arguments which have now been submitted, and I find my associates see no reason to vary their opinion then formed, after having heard more fully counsel on both sides. We think that in determining the question no force is to be given to the provision of section 8 of the Act of 1846; that that section was evidently designed merely to fix a date at which the parties who have sustained an injury by the taking of their waterrights may commence proceedings to recover their damages; that it was not designed to affect the nature of their remedy, or the rule for assessing those damages. The provisions of section 1 of the Act of 1846 correspond to the ordinary provisions for filing the location of a railroad, or for passing an order for the taking of lands for a highway by the selectmen, or county commissioners, or aldermen. The 8th section merely provides that such paper taking, or location, shall not authorize a party at once to take proceedings to have his damage assessed, but that his right to recover shall be postponed until the time of the actual taking, — in this case, the actual diversion of the water, not the whole, but any portion of the water; and upon such diversion, be it more or less, we think his right to recover his whole damages accrues; and we think the damages must be assessed upon

one petition, once for all; that it must cover any right that will be lost by him, or any right which will be acquired by the city by the exercise of any power under this act.

Then what is the taking for which damages are to be assessed? It is, in this case, the taking of water-rights. In the paper taking filed, it is called the taking of the water of Sudbury river. That, of course, can only be construed to mean the taking of the right to divert the water of Sudbury river, for it cannot, in the nature of things, be the actual taking of the water, but it is, within the terms of the act, a taking of water-rights, and by that taking we think the City of Boston acquires a right which the petitioner in this case lost. The question for us to determine is, what damage does the petitioner suffer by reason of the fact that he has lost a right, and the city has acquired it? Strictly speaking, I suppose the difference in the market value of the estate of the petitioner before the city exercised its authority under the act, and after it exercised it, is the measure of damages. Now, those damages, and that difference in market value, may depend, and must depend in some degree, upon the use which the city will make of its right so acquired; and we do not think that it of necessity follows, or is to be assumed, that the city will exercise that right to its fullest extent, by taking at all times all the water of Sudbury river except the million and a half gallons. It may be, we think, assumed, that the city will take every drop which it is for its interest to take, and it must be so assumed. The city, therefore, could not be allowed to come here, and show that it did not intend to take all the water of the Sudbury river, for it could not be heard to assert that it did not intend to exercise its full right, inasmuch as it might change its intention at any future time, and, still more, for the reason that there is no method of ascertaining what the intent of a city may be.

We think it is only competent to show facts relating to the character of the stream in question, and to the use of the water, which may necessarily or probably affect the limit and extent of use by the city. If, for instance, it could be shown to be physically impossible for the city to take the whole stream of the Sudbury river and convey it to the City of Boston, that fact could, we think, be shown as limiting the extent to which the city would exercise the right which it has acquired so to take and convey the whole stream of the Sudbury. In fact, the trial of this cause has proceeded throughout upon the assumption, on the part of both petitioner and the city, that at certain periods of the year the flow of the Sudbury river would not be discontinued or

reduced to the million and a half gallons per day. And I suppose no one of the counsel who has been heard before me would contend that that was either a reasonable expectation, or a theory upon which damages are to be assessed by us, that the stream will be used at all times, except to the extent of a million and a half gallons per day.

Mr. Storey. What we have said is, that there will be certain periods of the year when we conceive that the water of Sudbury river will not be necessary to make up that por-

tion of the Concord river to which we are entitled.

Mr. RICHARDSON. The Wamesit dam companies go upon the proposition that, if there is any more, perhaps it belongs

to somebody else.

Commissioner Russell. I was in error, perhaps, in referring to other cases. This evidence is only offered in this case. We think it is competent to show, that, from the nature of things, the whole of Sudbury river will not be diverted, although the city has the legal authority and the legal power to divert it, and has taken the proper measures to assert and vest in itself the right so to do.

Mr. Shattuck. With their reservoirs, I do not know

that it is not practicable to use it.

Commissioner Russell. That is a question of evidence. Mr. Shattuck. It only bears upon the question of law. Commissioner Russell. On the other hand, we do not think it is competent for the city to show by the testimony of experts the degree of probability as to the use which will be made of the water, or the degree of probability that the city will require the whole, or more or less of this water within a given period, but that the testimony must be limited strictly to the facts of the case; and that upon the ground stated by Chief-Justice Bigelow, I think, in the case of the Boston and Worcester Railroad against the Old Colony Railroad, — that in relation to this matter, there has been no such experience that any satisfactory opinion can be based upon it. We do not think it is within the province of the testimony of an expert to determine the probability that the city of Boston will apply the water of Sudbury river, to a greater or less extent, for production of power for manufacturing purposes, and we think it is not within the province of an expert to give his testimony, therefore, as to the extent to which the City of Boston may see fit to use the water of Sudbury river. We must assume that they will use it to the greatest extent to which it may be for their interest to use it, inasmuch as only by that assumption can we be sure that compensation will be made for the damage which may be suffered by the petitioners.

Mr. Storey. I should like to have, in the finding of the commissioners, the question reported in some shape, so that it will come before the court. My clients' claim is that, prior to the act of the city, we had a right to have Sudbury river flow by our mill; that, by the action of the city, we have been deprived of that right; and that the measure of

our damages is the value of that right.

Commissioner Russell. To all which I should agree entirely; but the measure of your damages by the loss of that right must depend somewhat on the probability as to how that right will be exercised; and it need not be assumed that it will be exercised in a manner in which it cannot possibly be exercised, nor that it will be exercised in a manner in which, in all reasonable probability, it never will be exercised.

There is a decision in a matter somewhat analogous to this, to which I will refer counsel: the case of Dickinson vs. Fitchburg, 13 Gray, 546. There the defendants sought to limit the petitioner's claim for damages for land taken for a highway, by showing that they had laid out that portion of his land which they took for a highway as a sidewalk, and therefore his estate was not injured by it. The court held that it was not competent to show that they had laid out that portion of the highway as a sidewalk, but that it was competent for the defendants to show, in reduction of damages, that from the circumstances of the case, that would be the probable use of that portion of his land. It seems to me that that case is very nearly analogous to that now before The town of Fitchburg there undoubtedly had a right to lay out a travelled way over the land taken from the petitioner, in which case his damages would have been greater than if they had laid it out as a sidewalk. It was held that the respondents had a right to show the use that would probably be made of that piece of his land taken.

Mr. Storey. In other words, you put it on the ground that (applying it to a city case) where a city has taken a strip of land to be used as a street, the measure of damages is not to be ascertained by taking the same rule as if that

strip were taken to build a brick wall on?

Commissioner Russell. Exactly. It is the purpose for which it is taken, and the use and the kind of use to which it is to be applied. I think the question is admissible as to any question of fact, not as to any matter of opinion.

A. FTELEY, continued.

Q. (By Mr. Butler.) Have you in the course of your employment by the city examined and understood the method of measuring the water taken from Lake Cochituate by the city? Do you know what the means of measuring are, and the means by which they do the measuring?

A. No, sir.

Q. You never have seen it?

A. No, sir.

Q. You know nothing as to how they measure the water that

comes from Lake Cochituate to the city?

A. I know that there are certain measurements made, which I am not acquainted with. I have heard it said, I recollect, that the water was sometimes measured by the fall in the siphon across Charles river. That is the only thing I can recollect.

Q. Do you know anything as to the quantity taken by the

city?

A. I know from the report published by the Water Board.

Q. No other way? A. No other way, sir.

Q. Do you know anything of the amount required by the city to supply its present inhabitants?

Mr. Shattuck. That is not competent, as I understand it.

Mr. Butler. Perhaps we can save all question. I only ask him whether he knows. If he don't know, that ends it.

Mr. Shattuck. I don't know that you can ask him if he knows,

if the evidence is not competent.

Mr. Butler. That is a fact, — to show how much the city now requires -

Mr. Shattuck. For mechanical and domestic purposes —

Mr. BUTLER. Yes; how much it takes —

Commissioner Russell. "How much it takes" is another question. The other question is ambiguous.

Mr. Butler. By "requires," I mean how much is necessary

for the supply of the city—
Commissioner Russell. That is capable of two different constructions. Do you wish to know whether he knows how much the city now uses —

Mr. BUTLER. Yes, sir.

Q. Do you know how much the city now uses?

A. Yes, sir; approximately.

Q. (By Mr. Shattuck.) How do you know it?

A. I know it from verbal information, and also from reading the reports published by the city; not otherwise.

Q. (By Mr. Butler.) At present, all that is taken from Sud-

bury river goes into Lake Cochituate, don't it?

A. To-day, yes, sir.

Q. And has for a year past?

A. There have been times when the Sudbury river was not turned on the lake.

- Q. I mean all that is diverted?
- A. Yes, sir; all that is diverted.
- Q. (By Commissioner Russell.) That is, ever since it was diverted?.

A. Yes, sir.

Q. (By Mr. Butler.) So that, if we can get at what the flow of Sudbury river has been since the diversion, we can get at how much has been used by the city from both Sudbury river and Lake Cochituate?

A. Yes, sir; I guess so.

Q. (By Mr. Shattuck.) Have you ever examined to see how the water which ran in the Sudbury river during the ten days after the rain of the last of July, this year, compared with the whole of the water that ran in the Concord river during the same period?

A. No, sir; I never made a comparison.

Q. There was rain on the 31st of July, and the Concord and Sudbury rivers were more or less affected, we will say, during the next fortnight, until both of them got back to the flow of the time previous. I would like to ask you if that is not correct?

A. Yes, sir.

Q. (By Mr. Butler.) During the time you have been measuring Sudbury river, have there been times when it was impossible for you to control the whole of the river—when there was a quantity of water ran to waste?

Mr. Shattuck. Control with what machinery? That little

wooden dam they have there, or what?

Mr. Butler. With that dam.

WITNESS. There were such times. There have been times when it would be impossible for the city to divert the water.

Q. Do you know the number of acres of flowage that the city proposes to flow by their reservoirs?

Mr. Shattuck. I suppose it is not competent to show the intent of the city.

Mr. Butler. That their reservoirs are calculated and made to flow?

A. The three reservoirs that the city now proposes to build will cover 600 acres.

Mr. Shattuck. That is not competent, what the city proposes

Commissioner Russell. I don't know whether you have put in the plans for those reservoirs or note. Were they part of the view?

Mr. Butler. They have made their levels; they have stakedout their flowage area, and they have done all they can until they build the dam. If they had built the dam, we should have a right to put in the fact.

Commissioner Russell. I think the mode in which the city propose to construct their works is admissible, although of course it is not admissible to show that they do not propose to construct other works which might further exhaust the river than those which they now propose to construct.

Q. (By Mr. Shattuck.) Have they begun to build any reser-

voirs?

A. They have begun to build the dams behind which the water will be backed.

Q. (By Mr. Butler.) To flood those 600 acres, to what aver-

age depth, can you tell me?

A. The maximum depth for the lower reservoir will be some 14 feet. The next one will be 19 feet, and the third one will be about 22 feet.

Q. Can you give us the capacity of those reservoirs?

A. Yes, sir; approximately. The lower reservoir, in the order I have named them, is to contain a little over 200,000,000 gallons; the next one in order will contain a little less than one-half billion gallons; and the third one will contain 1,100,000,000.

Q. Then the whole will be about one billion eight hundred

million?

A. Yes, sir; very nearly.

- Q. Will the water flow from the upper to the second, and from that to the last one?
- A. Yes, sir; two of them are on two different branches of the river, but they both flow into the third one.

Q. What is the maximum flow, if you know, of the Sudbury

river?

A. The maximum flow that I have seen, is 3,200 cubic feet per second. The table put in evidence shows that amount.

Cross-examination.

Q. (By Mr. Shattuck.) How long did that flow of 3,200 feet per second continue?

A. This is the average, for 24 hours, of the greatest flow.

Q. 3,200 cubic feet, was it?

A. Yes, sir.

Q. During the 14 days after the rainfall of July 31, the Concord river appeared to be affected by that rainfall, did it not?

A. I have seen it from the profiles that were shown me in

court.

Q. During that period, according to your tables, the aggregate flow of the Sudbury was how much from the 31st of July to the 13th of August, inclusive?

A. The average was 1,476 cubic feet in the Sudbury, and 7,084

cubic feet in the Concord.

Commissioner Francis. That does not really represent it.

Mr. Shattuck. This shows the proportion of the flow of the two rivers, that is all; it is simply proportional.

Mr. Butler. It does not show the proportion.

Mr. Shattuck. Why not?

Mr. Butller. Because one portion of the 14 days, when the Concord flowed a great deal less, the Sudbury flowed a great deal more.

Mr. Shattuck. I put it in for what it is worth; but it does

show accurately the proportion of the average flow.

Q. Now, it turns out that during those 14 days the flow of the Sudbury was a trifle more than one-fifth the flow of the Concord?

A. Yes, sir; so I find it.

Q. Now, I want to know if you can tell, taking your knowledge of the Sudbury meadows, and the extent of them for twenty miles and more, how much of the Concord river flow has come from the Sudbury river during that period?

A. I don't see that I can answer that question sir.

Q. Can you tell us, from any knowledge that observation or experiment has conferred on you, that the Sudbury did not contribute its fair proportion to the flow of the Concord during that whole period; that is 21 per cent. about?

A. I should say that there is no reason to suppose that it did

not contribute its fair proportion.

Q. Whether, from any observations you have ever made, or any experiments that have come to your knowledge, you can say that the Sudbury did not contribute substantially that proportion of all the water that flowed through the Concord river?

A. No, sir, I can't say so.

Q. Is not the recognized test of the value of the contributions of different parts of the water-shed of a river the measurements of the water-shed?

A. It is the general practice.

Q. Do you know of any better test than that?

A. No, sir. Excuse me — there is a better test, if you could

get gaugings for a great many years.

Q. But, taking gaugings for any one year or for less than three months in one year, would that, in your judgement, to any extent control the argument to be derived from the water-shed?

A. Experiments on the flowage during a certain number of months would give a pretty good indication of what the flow was at the moment the flow was taken. I should say that experiments during a very wet season or during a very dry season might give an indication of the extreme flows of the minimum and maximum.

Q. That is clear; but would the proportions contributed by the different parts of a water-shed, either in a wet or dry season, as ascertained by measurements during three months, be any substantial indication of the permanent flow?

A. It would be an indication, but not so as to weaken the

general rule.

Q. (By Mr. Richardson.) Would these few measurements for a short period of time be of any substantial value in determining the flow over a period of a great many years, in comparison with the rainfalls and water-sheds.

A. I should say that both methods, measuring the water-shed on one side and gauging on the other, are two different things altogether. You can't say that one compares entirely with the other. Measurements of the water-shed will be taken, usually, by engineers; but I should say that if there is a dry season, saying that the flow has been so much, for instance, lower than at the other periods of the year, it is obvious that, if the rainfall, which is least in summer time, does not furnish as much flow, it is a small proportion of the total yield of the water-shed, and consequently the difference that there is between such gaugings and calculations of the whole water-shed would not be as great as may

be supposed.

Q. Well, my question was this: would those measurements for this short period substantially control the conclusion which measurements of the water-shed and rainfall would lead you to for a period of thirty or forty years, or control the general rule, substantially?

A. Gaugings for one year could not control.

Q. Those you have made here?

A. I have made these for three years.

Q. Well, would they substantially control the conclusions which measurements of the rainfalls and water-sheds would lead you to for a period of forty or fifty years?

A. It would not change the calculations that an engineer would make generally of the water-shed, but it would be a very strong

indication of what may take place in a similar season.

Q. (By Mr. Storey.) I understand, that, in the natural state of things, the waters of Farm pond would flow into the Sudbury river, would they not?

A. Yes, sir.

Q. Now, I ask you whether, in making your measurements of the flow of Sudbury river, you have measured any water flowing from Farm pond into the Sudbury river?

A. Do you mean to include the flow from the particular water-

shed of Farm pond?

Q. Let me state my question exactly. I understand, that, in its natural state, the water from the water-shed of Farm pond would flow into Sudbury river?

A. Yes, sir.

Q. You have given us here some measurements of Sudbury river?

A. Yes, sir.

Q. Do those measurements include any of the water received by the Sudbury river from Farm pond or its water-shed?

A. Yes, sir.

Q. Where are the measurements made?

A. They are made in that way, because we cannot very well separate them. You probably know that Farm pond is on the way from the city ditch to Sudbury river; consequently, in measuring the water from the ditch furnished by the city, you cannot do otherwise than take the water from Farm pond.

Q. You measured the water in Sudbury river at the dam?

A. Yes, sir.

Q. That gives you what flows in Sudbury river, independent of

Farm pond?

A. Sometimes it may be dependent, and sometimes independent. There is a dam that separates Farm pond from Sudbury river. If that dam is closed when we make the measurements at Sudbury river, Farm pond is not included; on the contrary, if that dam is open, then it is included. What I mean to say is this: as there is no outlet from Farm pond but the Sudbury river and the city

ditch, as I have gauged both, whether the dam is open or shut, I

have on a certain day taken the flow of Farm pond.

Q. As I understand the matter, if the flow of water in Sudbury river is at a certain height, the water will flow into Farm pond, and when the water is low in Sudbury river, it will flow out again?

A. Yes, sir.

Q. Then the effect of your dam has been to raise Sudbury river sometimes so that it would include the flow into Farm pond from that ditch?

A. Yes, sir.

Q. When you are measuring the water at the dam, you are measuring it below the ditch that goes to Farm pond?

A. Yes, sir.

Q. And you are measuring it when the tendency of the water is to flow from Sudbury river into Farm pond,?

A. Either way; sometimes the flow might be reversed.

Q. Now, I want to ask you whether or not in your curve there are measurements made at the dam when the water was flowing

into Farm pond?

A. I have included in those measurements all the cases you can imagine. As I explained to you when I explained the gauges taken, there are various apparatuses. One is at the dam itself; another one is by observing the height of Farm pond; and another apparatus is to measure the water flowing into the ditch. Consequently, I will take the instance that you suppose; that is, I am measuring at the dam, and during that time the water is going into Farm pond. An apparatus at the dam, operated by that float, will give me by calculation the flow at the dam. Then, according to the quantity that goes into Farm pond from Sudbury river, Farm pond will either rise or fall, and that quantity will be controlled by the gauge giving me the level of Farm pond, and I will know the quantity from the surface area of Farm pond. Then if, beside that, I measure the quantity that flows into the city ditch in twenty-four hours, I will know what has passed at the dam, what has passed over the dam, what has been lost or gained through Farm pond, and what has been consumed by the city through the ditch.

Q. You will have the measurement of the water that has gone through the whole, and what has passed into the ditch through

Farm pond?

A. Yes, sir. I necessarily have the flow from the water-shed of Farm pond in my gauges; I cannot prevent it.

Q. You measure it when it flows into it?

A. I measure it in all manners. I will give you an instance. Suppose the city ditch is stopped, and there is no flow going to Cochituate Lake. Suppose Farm pond entirely isolated; by my gauge at Sudbury river, I will know that the flow of Sudbury river is so much. Now, on that particular day I will have the flow of Sudbury river exactly; and if the next day I have to reopen the communication of Farm pond with Sudbury river, and Farm pond with the city ditch, then I will be obliged to take into account the

water that would have accumulated in Farm pond during the

day it was separated from the rest.

Q. In other words, you add to the water you found on a former day, the water that would have flowed into the ditch from Farm pond in the natural way?

A. Yes, sir.

Re-direct.

- Q. (By Mr. Child.) The indications from the measurements which you had made on the Sudbury river, and from the measurements which you have seen here, as testified to, upon the Concord river, as taken during the last year, will they indicate precisely the proportions between the two rivers, in a similar season, at any time?
 - A. I believe so, sir.
 - Q. They will show it exactly and completely, will they not?

A. I believe so.

Q. In a season similar to the season of the last year, from your knowledge of the flow of the Concord river, and from your measurements of the flow of the Sudbury river, will the Sudbury river produce more than one-tenth of the total flow?

A. I believe that the indications of those simultaneous gaugings would be, that, in a similar year, the proportion would be about the same. As to the proportion being one-ninth or one-tenth, I don't know exactly what it is. It can be taken from the tables by computation.

Q. I wish you would calculate it and put it in. Is not the proportion between these two rivers, as appear from the gaugings, a criterion by which to judge those rivers in ordinarily dry seasons?

A. I should say it is a very strong indication that the general

comparison of the water is so.

- Q. (By Mr. Butler.) Do you know how much water was flowing by your dam, say on the first day of August; can you tell me that?
- A. I find that the total flow of the Sudbury river was 395 cubic feet. I have nothing here to tell me exactly what was going into the ditch, but I should assume that probably at that time something like ten or twelve million gallons would go into the city ditch, and there would be, consequently, 380 cubic feet left.

Commissioner Russell. Probably about 380 cubic feet going

over the dam?

A. Yes, sir; that is a near assumption, because I cannot recollect exactly how much was going into the ditch at the same time.

Q. How much was going by on the Concord river when that

point of highest flow was reached?

A. On August 3d, by this profile, there was 735 cubic feet per second.

Re-cross examination.

Q. (By Mr. Storey.) I understand you to say that in the same season or a similar season, a comparison of the Sudbury and the Concord would yield the same results?

A. I said that it would be a strong indication.

Q. Now, let me ask you what you would call a similar season?

A. A similar season would be a season when the flow would be generally low, contained between certain limits, and when there

would be one large rainfall or two, maybe.

- Q. Wouldn't it make a difference whether that large rainfall was on the Sudbury or whether it was down at Concord or at Lowell? Showers in summer are generally local. A large shower might be felt on the water-shed of Lake Cochituate which would not be felt on the waters of the Concord. Now, do you mean, given the same total rainfall, distributed in the same way, on the same area, the result would be the same; or do you mean that, taking the rainfall and distributing it in a different way, the result would be the same?
- A. No, sir; I take it in a more general way. I mean to say that if we take a season during which the rainfall has been about the same, and when the flow of Sudbury river has been about as it is now, the comparison of the two rivers, I believe, would be very near the same. It would be, as I said before, a strong indication that the result would be the same.

Q. That is to say, if the flow of the Sudbury and the Concord was the same as it was this summer, the proportion would be the

same as it is here?

A. Let me explain a little more fully. I will give you an instance. Take a summer which is very wet, and it may be that, the ground being soaked, the influence of any rains we have will show that the proportion furnished by the Sudbury at the place where these gaugings were taken would be greater. In this case we had a dry season. We see rains of some magnitude that do not produce any effect, or very little effect, on the Sudbury. We see that, in this case, a very large rain at a time when we had hardly ten cubic feet in the Sudbury, did not double it, and we see that we had a second rain, and one, too, of very great volume. I say, taking a season when rain would be equally scarce and about equally distributed —

Q. Falling in just the same way it does here?

A. About equally distributed, the indication would be strongly that the effect would be about the same. A different distribution

of rainfall might make a change.

Q. (By Mr. Shattuck.) Have you ever learned by observation that it took nearly a month for the water that fell at a particular time on Concord river to discharge itself over Talbot's dam?

A. No, sir.

Q. Suppose it did, what time should you allow for the water from Sudbury river to reach the Wamesit dam?

A. The only thing I can judge by is the distance.

Q. Do you know anything about the peculiar nature of the Sudbury meadows?

A. I understand that there is a very slight fall from Billerica to

Wayland.

Q. Of course, if you knew that it did take that length of time

for the water to discharge from Concord river that would affect your judgment somewhat as to the flow of the Sudbury?

A. If it took one month, I would merely say that the effect of

the Sudbury would be felt later; I can't say how much.

Q. And a large rainfall on the Sudbury would be distributed over a long period, would it not?

A. Yes, sir.

CLEMENS HERSCHEL, recalled.

I would like to make an explanation in regard to my use of the word "waste." At the time I was gauging Concord river at Massic dam, I had an observer up at North Billerica, and when water wastes over that dam, that is what I should call waste. That is what I mean by the use of the word "waste" in this case. I have the dates when the water wasted up there. The observations up there were taken at noon time, when the mill shut down at noon, in the evening, and at a quarter past six in the morning, before the mill started. The noon-time observation is not of any controlling value; of course it depends upon what the mills happen to draw that day. I have not plotted those, but I have plotted the observations taken at nine o'clock in the evening, and at 6.15 o'clock in the morning, every day except Sunday, and Sunday they were taken at 9 o'clock in the morning. Generally, with only two or three exceptions, when the water is level with the top of the North Billerica dam, if it wasted at the North Billerica dam in the morning at 6.15, it also wasted there at 9 o'clock the night previous. As I say, there are only two or three exceptions to that. The days when it did not waste at the dam at 6 o'clock in the morning were July 9, and 18 to 22, both inclusive; August 28 to September 1, both inclusive; September 5 to 17, both inclu-That makes, if I have counted them up right, twenty-eight days out of the whole number of days from July 6 to September 24, inclusive.

Q. (By Mr. Childs.) How many days?

A. Eighty days.

Q. Then there are twenty-eight days out of eighty that the water did not waste over the dam at Billerica at any time in the night?

A. Yes, sir. At 6.15 in the morning before the mill started.

Every other night it wasted over the dam.

Mr. Butler. I now offer the conveyance of the Wamesit Power Company to the city.

Mr. Shattuck. For what purpose?

Mr. Butler. For the purpose of showing that they were, at the time of the filing of some, at least, of these petitions, and I believe all, — joint owners of the dam at Wamesit with the other water-takers.

Mr. Shattuck. If you will put in the whole transaction, to show the exact nature of their title, I will not object.

Mr. Butler. I am now offering a certain conveyance, sir.

Mr. Shattuck. I might suggest a diminution of the record. Not that technically, but substantially.

Mr. Butler. I suppose you do not want me to call the

subscribing witnesses?

Mr. Shattuck. No, sir; but I want the whole transaction put in. I object to the introduction of the deed, unless the whole transaction in relation to that water goes in.

Mr. Butler. I offer the deed of the Wamesit Power Company to the City of Boston of a part of the water-power of the Wamesit dam, dated the first day of December, 1875.

Mr. Richardson. That was after the taking and the filing

of the petitions.

Mr. Butler. I do not know that it was not.

Mr. Shattuck. There is a contemporaneous agreement to convey it back for nothing, which can be enforced at any moment. That is quite material.

Commissioner Russell. I fail to see how the deed is

competent.

Mr. Storey. In my particular case, the city were served with a summons on the 16th of July, 1875. This deed is dated December 1st, 1875.

Mr. RICHARDSON. All the petitions were filed before that

time.

Mr. Butler. I will read a portion of the deed.

"Said Wamesit Power Company, in consideration of fifty-five thousand dollars, and other sufficient considerations, the receipt whereof is hereby acknowledged, said company thereunto moving, does hereby release the City of Boston of, and from, every and all damages, compensation and claim of damages of whatsoever name or nature, arising out of, or because of, the taking of the water of Sudbury river, a branch of the Concord river, under and by virtue of the provisions of said act, or however otherwise taken by said

city up to the date hereof.

And in addition said Wamesit Power Company, for the consideration aforesaid, does convey, transfer and set over to said City of Boston, the amount of water which may flow in their said canal equal to the aliquot part of sixty-six (66) cubic feet of water per second whenever the water is below the level of the permanent stone dam of said company, said aliquot part being that which will flow in and through said canal when the water is below the top of said permanent stone dam, being sixty-six two hundred and eighty-eighth parts $(\frac{66}{283})$ of said water then and there flowing, to be drawn by the City of Boston or their assigns, as each may choose to do, through any of the penstocks or flumes of any of the proprietors of water who have now a right to draw the same from said canal,

other than said Wamesit Power Company, through which said city or its assigns may elect to have said water drawn, whether through one or more of said flumes or penstocks. This right to draw water by said city or its assigns to be exercised only for eleven and one-fourth $(11\frac{1}{4})$ hours per day for six days (6) days in each week for ever, but not more or otherwise."

Commissioner Russell. But the petitioners stand upon their own right as to that water-power; and how does it make any difference whether the city is the owner of the remaining right, or the Wamesit Power Company? Each has an equal right to restrict the petitioners to the use of the water that belongs to them, and an equal interest it doing it.

Mr. Butler. Suppose I show that, they being the owner of that dam, $\frac{66}{288}$ is more than, by any computation, Sudbury river can furnish; that is, it is more than one-fifth, or 22 per cent., or any other per cent. that can be calculated; and that I follow it by testimony to show that the city allowed these water-takers to draw that amount of water through their flumes; and that they, therefore, have suffered no damage, and have had yet no water of theirs taken from them?

Commissioner Russell. We do not think it would be competent to show that. We do not consider that competent, after the petition is filed, and the rights of the petitioners

fixed.

Mr. Butler. Very well. We offer it, and you rule

upon it.

Mr. Richardson. It is no more than saying that they have got money enough to pay by money. They cannot settle by water; they can settle by money. Any way, I do not think it varies the rule or the petitioners' rights.

Mr. Butler. Their rights were fixed long before they filed the petition, and now they are carrying on their petition against the joint proprietors, who have as much interest in the preservation of the water as they have. I don't think they can get along that way.

Commissioner Russell. That goes back to your original proposition, that they have joined with the Wamesit Power Company. It is hardly possible to join the city at that stage

of the proceedings, as they were then not owners.

Mr. Butler. They can join at any stage.

Commissioner Russell. Not in both capacities, of peti-

tioners and respondents.

Mr. Butler. It may raise a difficulty, which I do not feel at all troubled about myself. But if you rule it out, there it is; we offer it.

Commissioner Russell. I cannot see the competency of

it, even if followed by the testimony proposed.

Mr. Butler. I now offer, on behalf of the city, in mitigation of damages, or compensation for any water taken, an amount of water in the river, to each of these complainants, to flow through the raceways and penstocks of each of these complainants, equal to the entire flow of the Sudbury river, to which they are entitled under their several deeds put in the case. That is to say, assuming that the flow of the Sudbury is 22 per cent. of the waters of the Concord (which is the highest amount claimed), we offer to the Sterling mill, who have thirty-six cubic feet per second, an amount of water equal to 22 per cent. of the thirty-six cubic feet, and to convey it, and file a deed, if competent for the city to give a deed of that water, to the party forever.

Mr. Shattuck. We should be glad to get it, if we could see any practical way to take it, and should heartily accept the offer. But there are difficulties in the way of getting it.

Mr. Butler. If you object to the deed, of course we need not file the other deed; but I offer to file the other deed if this is admitted.

Commissioner Russell. You mean to say that you offer such a deed in connection with this one?

Mr. Butler. Yes, sir.

Mr. Shattuck. If you will convey all the water there is in the sixty-six feet, so that nobody can use the water for the Wamesit mills unless there is more than 288 feet, I do not believe there will be any difficulty in settling.

Commissioner Russell. We must see what you propose to offer in the way of evidence, not what you propose to offer by way of compromise to these parties. We have nothing

to do with that as commissioners.

Mr. Butler. There is where I am sorry to differ from you; it is not pleasant to do so. I think we have this right, under the obligation imposed upon us to make compensation. I think you will find a case to that effect. However, I am trying to get along. I make my offer in good faith, and about a matter of very high concernment. These gentlemen have a right to draw so many feet of the water, and that is all the right they have. When the water is at the height of the permanent stone dam, this will not harm them. When it is below that, we offer them all the water they can possibly have. I have made that offer heretofore — made it to them in person; but I have not been able to get anybody to take any water; they all want money.

Mr. Shattuck. You offered it in such a way that nobody could take it. I understand now that the Wamesit Power

Company will agree to shut off their flumes and gates, and not draw any water unless there is over 288 feet running in the river?

Mr. Butler. Yes, sir; they will be bound to do that. Mr. Shattuck. There is no practicable way of doing that.

Mr. Butler. It is perfectly practicable. We have saved two cubic feet to fill our boilers, and the rest we have sold to the city, and the city will convey it to you, gentlemen, which is 25 per cent. of all the water which you are entitled to by your deeds. That is the proposition I make.

Mr. Storey. We do not object to the admissibility of the deeds from the city until the deeds are offered. When the deeds are presented, the question of their admissibility

will be considered.

Mr. Butler. We can go to work and have the deeds made; but if you are going to rule out our title, there is an end of it.

Commissioner Russell. All that is now offered before us is a certain deed from the Wamesit Power Company to the City of Boston, with the statement that it is offered for the purpose of showing that the City of Boston became, at the date of that deed, and remains, a joint owner with the petitioners of the water-power of the Wamesit dam; and upon that offer, for that purpose, I rule that the deed is not admissible. The offer is then made that the city will, if that deed is admitted in evidence, supplement the offer of that deed in evidence by filing in this case deeds of the several petitioners of certain portions of the water-power upon the Wamesit dam.

Mr. Butler. Yes, sir; equal to the entire amount of the

water furnished upon that dam by the Sudbury river.

Commissioner Russell. It is for the petitioners to say whether they will accept the grant of any such deeds, when offered. It is sufficient for the commissioners to say now, that no such deeds are offered, nor is it alleged that any such deeds are now in existence, so that they are capable of being offered. If they are offered, we are not instructed whether or not the petioners will object to the introduction of those deeds, in addition to the deed which is now offered in evidence.

Mr. Butler. My own belief is, that it is competent, upon this ground: that we have put into that canal considerably more water than we have taken out, and it will remain there forever, as it stands now, to be drawn from that canal.

Mr. Richardson. Suppose the city own it to-day, and you put in an argument to these gentlemen that, forever hereafter, that water is made up, so that really they are not

damaged: to-morrow the city may sell it, or convey it back

to the Wamesit Company.

Mr. Butler. I understand that argument thoroughly, and therefore I supplement that offer by making an offer of the deeds.

Mr. RICHARDSON. That is an offer for a settlement which I am not authorized to make.

Commissioner Russell. I can only rule upon that which is offered in evidence, and I rule that this deed is inadmissible.

Mr. Butler. There is one thing further, and this is it: The engineer is making up a table out of the other tables which have been put in. I am now in this trouble; I cannot cover the measurements in that table of water in Lake Cochituate by any man who is in existence. Possibly I can go back to 1870, but that depends upon a witness who will be here at the next hearing. If the commissioners rule out the report, then I do not see how I can furnish the evidence of the measurements, for the best I can do is to take the man who has measured the water, and he does not know any more about it, perhaps, than the man who takes the rain-gauge hardly so much, because the man who takes the rain-gauge would know what the rain-gauges measured; but the man who measures the water reports something to somebody else, who calculates it, and then those calculations and those measurements are assumed to be correct, and put in the reports. But I cannot find the man who made the measurements for any series of years.

Mr. Shattuck. The commissioners, as I understand,

have ruled that it was not necessary to do that.

Commissioner Russell. What the commissioners intended to rule was, that you are bound to show that measurements were accurately kept by the city, and that the result of those measurements was copied in those tables; and certainly the parties who made the report are themselves better evidence than the report which they made which is now offered.

Mr. Butler. The difficulty is, that part of the report

was made by a man who is reporting in heaven now.

Commissioner Russell. I have have no doubt the city can show the fact that it has kept measurements, show how they were kept, and show the results that they have derived from them. If you fail in that, we will see what is the next best evidence you can offer.

Mr. Child. I desire to put in the profile of the flow at Talbot's dam,—the one which Mr. Herschel has just testified to.

CLEMENS HERSCHEL, recalled.

Q. (By Mr. Child.) Is this a profile of observations and measurements at Talbot's dam, in Billerica, taken by an observer in your employ, from the 28th day of June, to the 23d day of September, 1876?

A. Yes, sir.

Mr. Shattuck. Is this put in as applicable to the Talbot case, or ours only?

Mr. Butler. As applicable to your case.

[Adjourned to Friday, Oct. 20, at 9½ o'clock.]

FRIDAY, October 20th.

The commissioners met at 10 o'clock, A.M.

CASES ON THE WAMESIT DAM, resumed.

Mr. Butler. I have here two tables which I have caused to be prepared, taken from documents already in. The first table shows the rainfall at Lake Cochituate, for the months of July, August, and September, from 1852 to 1876, inclusive. The second table shows the rainfall in Boston, for the months of July, August and September, from 1842 to 1876, inclusive. The average rainfall at Lake Cochituate for July, August and September, from 1852 to 1876, was 13.87, and the rainfall for the same months in 1876, 15.37, — showing that there has been almost an inch and three-quarters more this year than in the average of the years.

The Boston table shows that the average rainfall at Boston, for July, August and September, 1842 to 1876 (that is, for thirty-four years) was 12.25; for this year alone the rainfall was 11.94,—showing how near the rainfall of this

year is to being an average rainfall.

The following are the tables:—]

Table showing Rainfall at Lake Cochituate for the months of July, August and September, from 1852 to 1876, inclusive.

YEARS.	July.	August.	September.	Totals.
1852	2,16	8.27	2.04	12.47
1853	2.84	7.20	5.44	15.48
1854	2.32	0.28	3.68	6.28
1855	3.86	0.77	0.75	5.38
1856	1.76	11.40	3.13	16.29
1857	8.85	6.62	4.27	19.74
1858	3.46	6.42	5.17	15.05
1859	0.99	7.69	4.56	13.24
1860	6.82	4.89	9.92	21.63
1861	1.62	7.79	2.76	12.17
1862	6.54	1.43	2.62	10.59
1863	14.12	5.61	3,39	23.12
1864	1.06	3.56	1.52	6.14
1865	3.10	3.36	1.66	8.12
1866	13.35	3.98	8.36	25.69
1867	5.36	12.36	1.08	18.80
1868	2.16	7.38	7.69	17.23
1869	2.63	2.34	8.49	13.46
1870	3.10	2.03	0.64	5.77
1871	2.20	3,56	1.46	7.22
1872	5.55	9.76	6.29	21.60
1873	4.08	7,17	2.62	13.87
1874	3.16	4.83	1.55	9.54
1875	3.57	5.53	3.43	12.53
1876	9.49	2.19	3.69	15.37
Average	4.57	5.46	3.85	13.87

Average rainfall at Lake Cochituate July, August and September, 1852-76 = 13.87 Rainfall at Lake Cochituate July, August and September, 1876 = 15.37

Table showing Rainfall in Boston for the months of July, August and September, from 1842 to 1876, inclusive.

YEARS.	July.	August.	September.	Totals.			
1842	1.82	4.44	3.25	9.51			
1843	2.15	6.88	0.98	10.01			
1844	2.17	2.62	3.53	8.32			
1845	3.28	1.82	2.23	7.33			
1846	2.51	1.80	1,30	5.61			
1847	2.65	6.45	6.64	15.74			
1848	1.35	3.10	3. 55	8.00			
1849	0.85	6.25	1.25	8.35			
1850	2.70	5.30	7.15	15.15			
1851	3.09	1.27	3.50	7.86			
1852	3.28	7.63	1.65	12.56			
1853	3.64	9.40	3.80	16.84			
1854	3.70	0.58	3.86	8.14			
1855	4.15	1.46	1.13	6.74			
1856	4.02	11.11	4.90	20.03			
1857	5.53	7.18	2.56	15.27			
1858	4.56	7.03	5.02	16.61			
1859	1.58	4.72	4.40	10.70			
1860	5.90	4.30	7.35	17.55			
1861	2.76	6.04	1.77	10.57			
1862	7.33	4.20	5.61	17.14			
1863	12.38	5.64	3.12	21.14			
1864	1.90	4.17	2.60	8.67			
1865	4.26	1.42	0.62	6.30			
1866	5.42	3 .87	5.90	15.19			
1867	4.76	10.78	0.44	15.98			
1868	1.10	7.53	11.95	20.58			
1869	3.30	2.19	5.18	10.67			
1870	4.01	1.57	0.67	6.2 5			
1871	2.87	3,31	1.37	7.55			
1872	4.48	10.48	7.37	22.33			
1873	3.25	6.46	2.78	12.49			
1874	2.70	6.48	1.66	10.84			
1875	3.84	3.50	3.32	10.66			
1876	6.50	1.82	3.62	11.94			
Average	3.71	4.94	3.60	12.25			

Mr. Butler. I believe we have nothing else to offer. Commissioner Russell. Has Mr. Shattuck anything else to offer?

Mr. Shattuck. We have closed all the Wamesit dam cases. I shall put in some matters in the Belvidere case which may have a bearing upon this (it is hardly worth while to keep this case open on that account); for instance, anything which bears upon the water in Concord river, and also some testimony that I may put in on the use of steam, which has some bearing on these other mills. I don't care to put it in twice. It may just as well go in in these other cases as in this. The commisioners will also understand that as to what is called the Belvidere mill of Wamesit dam we did not put in our title. It was only in one deed; but it is on a petition with the lower Belvidere, both mills being of the same corporation and on the same petition.

Mr. Butler. I want to call your attention to the fact that you have not given your title in the "Belvidere No. 2"

case at all.

Mr. Shattuck. I know that. I said at the time that I should not. I have got the deed, and I can put it in in a very few minutes. I did not want to divide that petition.

Mr. Butler. I don't care when it goes in, if it goes in at some time. I only want to see that there is a title

proved.

Mr. Shattuck. To the "Belvidere No. 2" there is only one deed. The "Belvidere No. 1" will require a great many deeds.

Mr. Storey. In regard to this testimony that Mr. Shattuck proposes to offer in regard to the flow of the Sudbury river and in regard to the use of steam, I supposed the testimony would be put in in this case, and I wanted to get the benefit of it. I, therefore, don't want this case closed yet. But if it ceases to be testimony in this case, I thought, nevertheless, that Gen. Butler might consent that it should be taken in the case which is to follow, — that any testimony applicable to the Wamesit dam cases may be taken in the cases of "Belvidere mill No. 1" and "Belvidere mill No. 2."

An agreement to the foregoing effect was entered into, namely,—

Agreed, that any testimony applicable to the cases of the parties owning upon Wamesit dam, which may be introduced in the cases on the petition of the Belvidere Company, may be used in the cases which have already been heard for parties petitioning on the Wamesit dam, and also in the case on the petition of Mrs. Richmond.

NANCY L. RICHMOND vs. CITY OF BOSTON.

D. S. & G. F. RICHARDSON appear for the petitioner.

Mr. G. F. RICHARDSON reads the petition of Nancy L. Richmond:—

COMMONWEALTH OF MASSACHUSETTS.

Middlesex, ss.

To the Sheriffs of our several Counties or their deputies.

Greeting: —

We command you to summon the City of Boston, a municipal corporation established under the laws of this Commonwealth, in the County of Suffolk, to appear before the Justices of our Superior Court, to be holden at Lowell, within and for our County of Middlesex, on the first Monday of September next, and answer to the petition of Nancy L. Richmond, of Lowell, aforesaid, filed in the office of the Clerk of the Courts for said county of Middlesex on the day of the date hereof, a true and attested copy of which petition is hereto annexed.

And have you there this writ with your doings thereon.

Witness, Lincoln F. Brigham, Esquire, at Cambridge, this tenth day of June, one thousand eight hundred and seventy-five.

THEO. C. HURD, Clerk.

To the Hon. the Justice of the Superior Court now holden at Cambridge, within and for the County of Middlesex and Commonwealth of Massachusetts:—

Your petitioner, Nancy L. Richmond, of Lowell, in said county, respectfully represents that she now is, and has been for more than three years now last past, the owner in fee-simple and possessed of a certain piece or parcel of land with the buildings thereon, situate in Lowell, in said county, which is bounded and described as follows, viz.: a certain piece of land, with the buildings thereon and machinery and fixtures therein, situate on the easterly side of Lawrence street, and thus bounded, viz.: beginning at the northwesterly corner of the premises on the easterly side of said street at the southwesterly corner of land of one Dugdale, thence by said Dugdale land easterly one hundred and forty-two and five-tenths feet, more or less, to Concord river, still in and across said river to land of Rogers, thence up said river southerly to the north side of a large rock at the foot of Massic falls, so called, and on the east side of said river; thence N. 84° E. three rods to a black-oak tree, marked, and then in the same course two rods further to a stake and stones; thence S. 2° W. fifteen and eight-tenths rods to a stake and stones two rods easterly of a black-oak tree, marked; thence S. 75° W. two rods to a black-oak tree, so on in the same course

three rods to a small oak-tree and a stone at said river; thence southerly up said river by high-water mark sixteen rods; thence across said river in such a direction as to strike the northeasterly corner of land now or formerly of Harriet M. Clark, at said river, and on the westerly side thereof; thence northerly along the bankwall on the westerly side of said river till it comes to the northeasterly corner of land of William H. Loughlin; thence westerly by said Loughlin land to Lawrence street; thence northerly along said Lawrence street to the point of beginning, together with the island and fall and dams and structures within said bounds, and all the water-rights, water-power and water privileges, and all other rights, easements and privileges belonging to or in any way appertaining to said land, falls, dams and structures, and also upon the same a valuable dam across said river within said limits, and sluiceways, flumes, raceways, water-power, water-rights and waterprivileges supplied by the waters of Concord river, with the right to maintain, increase and improve the same; also upon the said premises, one paper-mill and two woollen mills, with the machinery,

apparatus and wheels connected therewith.

And your petitioner further says, that for more than three years now last past she has been, and now is, seized and possessed of the land, buildings, rights, privileges and water-power aforesaid in fee-simple, and of right ought to enjoy the same uninterrupted, and the use of the waters of Sudbury river and Farm pond and their tributaries, as they would natually flow into said Concord river to her said premises, the said Sudbury river and Farm pond having been from time immemorial tributary to, and flowing into, Concord river, and supplying the same in natural channels with large quantities of water above said dam. And your petitioner says, that for more than three years last past she has had, and still has and possesses in fee-simple the right that said Concord river should flow in the same manner, quantity, volume and force, and within the same limits and channel, and with the same sources of supply as said river did before the action of said City of Boston hereinafter set out, and had done from time immemorial, and that the waters thereof should continue to flow to said dam in its accustomed and ancient channels, and by suitable canals and sluiceways made by petitioner on her premises aforesaid, that the quantity of water in said Concord river might flow on to her said premises, to be used by her for water-power and other purposes on her said premises. And your petitioner says that she is, and for more than three years last past has been, seized and possessed in fee-simple of the right to have the waters of said Farm pond, so called, situate in Framingham, in said county, and of Sudbury river, and their tributaries, flow in their natural and ancient channels into said Concord river above said dam, and to said dam, and by means of canals and sluiceways to, and on and over, her said premises, to supply her with her water-rights and water-power as aforesaid thereon, as they naturally would have done but for the acts and doings of said City of Boston as herein set out. And your petitioner further represents that she now owns, and has owned for the past three years the right to use on her said premises all the waters of said

Concord river for all legal purposes as her property, and the right to utilize the same for the purpose of supplying water-power, water-rights and water privileges on her said premises. And your petitioner further represents that, by virtue of an act of the Legislature of the Commonwealth of Massachusetts, entitled "An Act to authorize the City of Boston to obtain an Additional Supply of Pure Water," approved April 8, 1872, the said City of Boston, situate in the County of Suffolk, has, within three years last past, first actually taken, at the point or points authorized by said act, through the agency pointed out in said act, and for the purposes therein set forth, all the waters of said Sudbury river and all the waters of said Farm pond, and of the streams and tributaries, whether natural or artificial, flowing into them by means of certain dams, obstructions and works built by said city under said act and the authority thereof, and for the purposes therein authorized, and still continues and maintains said taking and said dam obstructions and works, and have withdrawn and diverted the waters of said Sudbury river and Farm pond and their tributaries from their natural flow, course and current, so that the waters thereof no longer flow into said Concord river, and are prevented by said city from so flowing and from passing in their natural channel, and by canals and sluiceways, to and on said premises of your petitioner, as she is rightly entitled to have them flow, and as they would flow naturally if not so interrupted. And your petitioner further says, that by the acts of said City of Boston, she is deprived of a large part of her water-power, rights, privileges, and other rights aforesaid, and of her right to the natural flow of water to and in said Concord river, and to her said dam, canal and sluiceways, and of the right to have the same flow from said Concord river to, upon and over her said premises, to supply her rights, easements, privileges and water-power aforesaid upon her said premises; and the City of Boston has taken and appropriated as aforesaid all the waters of said Sudbury river and Farm pond and their tributaries to their own use, to the great damage of your petitioner, sustained in her property aforesaid. And your petitioner further says, that by the taking of the waters of said Sudbury river and Farm pond and their tributaries, and by the erection and maintenance of their said dam and works, and by the acceptance of the powers and privileges given by said act by said city, and by the acts and doings of said city under said act, and by their taking and interfering with, and injury to, the use and enjoyment of the waters of said river, to which at the time of such taking your petitioner was justly entitled, your petitioner has sustained great damages in her property; and she has not agreed, and has not been able to agree, with said City of Boston upon the damages to be paid her therefor, and said city has not offered to pay her as such damages any sum whatever. Wherefore your petitioner prays this honorable Court for the assessment of her said damages for the taking of the said waters of said Sudbury river and Farm pond and their tributaries, and the acts and doings of said city aforesaid, and that, after due notice and summons to said City of Boston, will appoint, upon default or hearing of said

City of Boston, three judicious and disinterested freeholders of this Commonwealth, who shall assess said damages according to law, and that all such other and further proceedings may be had in the premises as to law and justice shall appertain.

NANCY L. RICHMOND.

Lowell, June 10, 1875.

Mr. G. F. RICHARDSON. We do not find any answer in this case, but I presume the answer is the same as in the Wamesit dam cases.

The answer, being the same as in the Wamesit dam cases,

is not printed.

The evidence in this case will probably be short, from the fact that so much ground has been covered in the other cases

by the evidence.

This differs very substantially from the other cases that have been heard, from the fact that this mill has been used for a paper-mill, making it necessary to run it nights as well as in the daytime. Many years ago it belonged to P. O. Richmond, of Lowell. In 1858 it came into the hands of C. B., Mary L., John B., Alanson J., and Caroline F. Richmond. A deed was executed in that year by which Caroline F. was to own an undivided eighth, Mary L. an undivided eighth, John B. an undivided eighth, C. B. Richmond an undivided eighth, and A. J. Richmond an undivided half. Subsequently, by several conveyances, C. B. Richmond bought out Mary L.'s eighth, and bought also John B.'s eighth. Subsequently he bought also Caroline F.'s eighth, which, with the eighth he owned, gave him an undivided half. A. J. Richmond subsequently died. His estate was settled. He died intestate, leaving quite a number of children. Samuel W. Stickney was appointed guardian of the children; and, under license of the court, he sold their interest to C. B. Richmond, which was an undivided half,—the half which Alanson J. had owned,—so that at that time the entire title was in Charles B. Richmond. Here is the deed from the guardian, dated August 1st, 1863, to Charles B. Richmond: —

Know all men by these Presents, That whereas, I, Samuel W. Stickney, of Lowell, in the County of Middlesex, and Commonwealth of Massachusetts, guardian of James H. Richmond, Herbert Richmond, Walter S. Richmond, Anna De Rose Richmond, Elbert W. Richmond, and Bayard Richmond, all of Belmont, in said county, minors, and children of Alanson J. Richmond, late of said Lowell, deceased, by an order of the Probate Court held at Lowell, within and for said County of Middlesex, on the second day of

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June, in the year of our Lord one thousand eight hundred and sixty-three, was licensed and empowered to sell and pass deeds to convey certain real estate of the said minors; and whereas I, the said guardian, having given public notice of the intended sale, by causing notifications thereof to be published once a week for three successive weeks, prior to the time of sale, in the newspaper called the Lowell Weekly Journal, printed at said Lowell, and having first taken the oath, and given the bond by law in such cases required, did, on the twenty-first day of July, in the year of our Lord one thousand eight hundred and sixty-three, pursuant to the order and notice aforesaid, sell by public auction, the real estate of the said minors, hereinafter described, to Charles B. Richmond, of said Lowell, for the sum of nine thousand two hundred thirty-two and $\frac{800}{1000}$ dollars, he being the highest bidder therefor.

Now therefore know ye, that I, the said Samuel W. Stickney, guardian, as aforesaid, by virtue of the power and authority in me vested, as aforesaid, and in consideration of the aforesaid sum of nine thousand two hundred thirty-two and \(\frac{80}{100}\) dollars to me paid by the said Charles B. Richmond, the receipt whereof is hereby acknowledged, do, by these presents, give, grant, sell, and convey unto the said Charles B. Richmond, his heirs and assigns, all the right, title, and interest of said minors in and to the following parcel of land, with the buildings thereon, and machinery and fixtures therein, situate on the easterly side of Lawrence street, in said Lowell, and thus bounded and described, viz.: Beginning at the northwesterly corner of the premises at a stone-bound on the easterly side of said Lawrence street, at the southwesterly corner of land formerly of J. F. Gage; thence by said Gage land, one hundred and twenty-eight and 7 feet, more or less, to Concord river, and still on across said river to land of the Rogers; thence up said river, southerly, to the north side of a large rock at the foot of Massic falls, so called, and on the east side of said river; thence northerly 84° easterly, three rods to a black-oak tree, marked, and then in the same course, two rods further to a stake and stones; thence southerly 2° westerly, fifteen and $\frac{8}{10}$ rods, to a stake and stones, two rods easterly of a black-oak tree, marked; thence southerly 75° westerly, two rods to a black-oak tree, and so on in the same course, three rods to a small oak-tree and a stone at said river; thence southerly, up said river, by highwater mark, sixteen rods; thence across said river, in such a direction as to strike the northeasterly corner of land now or formerly of Harriet M. Clark, at said river, and on the westerly side thereof; thence by said Clark land, and land now or formerly of S. N. Wood, westerly, one hundred and forty-six and $\frac{45}{100}$ feet, more or less, to said Lawrence street; thence northerly, on said Lawrence street, four hundred and twenty-four and $\frac{90}{100}$ feet, to a large elm-tree; thence still northerly, by said Lawrence street, two hundred and fifty-three and 4 feet, to the point begun at; together with the island, and falls, and dams and structures within said bounds, and all the water-rights, water-power and water privileges, and all other rights, easements and privileges belonging to, or in any way appertaining to, said land, falls, dams and structures.

Being the same premises described in a deed from Lucy A. Richmond and others to said Alanson J. Richmond, dated April 27, A. D. 1858; recorded with Middlesex Deeds, North District, book 15, page 37.

To have and to hold the aforegranted premises, with all the rights, privileges and appurtenances to the same belonging to him, the said Charles B. Richmond, his heirs and assigns, to his and

their use and behoof forever.

In witness whereof, I, the said Samuel W. Stickney, guardian, as aforesaid, have hereunto set my hand and seal, this, twenty-third day of July, in the year of our Lord one thousand eight hundred and sixty-three.

Signed, sealed, and delivered,

in presence of

J. F. Rogers.

SAMUEL W. STICKNEY,

Guardian.

[\$10 stamp.]

Subsequently Mr. Richmond died, leaving a will, which was duly proved, in September, 1873; and by that will, after making some specific bequests, he gives all the rest and remainder of his estate, of every kind, name, and nature, to his wife, the present petitioner.

Mr. Butler. Won't you give the consideration of that

half?

Mr. G. F. RICHARDSON. It is done in this deed.

Commissioner Russell. The agreement is thus: Title of petitioner admitted, and deed from Samuel W. Stickney, guardian, to Charles B. Richmond, is printed for the purpose of showing the description of the premises and the consideration of the conveyance. The consideration is \$9,232.80.

Mr. G. F. RICHARDSON. In this conveyance there was the release of the right of dower of the widow of Alanson J. Richmond. That need not be printed. In some of the old conveyances reference is made at different times to mortgages on the property. Those have been all paid, and the title stands now in Mrs. Richmond, free and clear of all incumbrance.

TESTIMONY FOR THE PETITIONER.

Daniel Coburn, sworn.

Q. (By Mr. G. F. Richardson.) Where do you reside?

Q. How long have you lived there?

A. I was born there and lived there most of my days. I am fifty-seven years old.

Q. How long have you known this Massic falls property?

A. Forty-five to forty-seven years.

Q. As near as you can remember the condition of the property. has there been any substantial change in the dam?

A. I should think it may have been raised or lowered a little;

I am not sure about it — not so long ago as that.

- Q. For the last twenty years you have known it somewhat?
- A. Yes, sir, for the last twenty years I have known it somewhat; and I should say it has not been changed.

Q. Were you employed by the owners at different times to work

in relation to the water-works there?

A. Yes, sir; for the last fifteen or twenty years my business has been that of a millwright and mechanical engineer, and setting wheels and adjusting machinery and laying it out.

Q. How many of the wheels that are used there have you as-

sisted in setting?

A. Four of them. I think there are five wheels.

Q. Now, won't you give us the wheels in their rated capacity? Take the wheel up nearest the Concord river?

A. There are two wheels nearest the Concord river. Blake wheel drives the paper-mill engines.

Q. Now take what you call the Blake wheel in the paper-mill. What was the horse-power of that?

A. That was rated at thirty horse-power, I believe.

Q. What is the actual power?

A. A little over fifteen.

Q. That is a five-foot wheel?

A. Yes, sir, that is a five-foot wheel.

Q. And what per cent. does it give of power?

A. I think that wheel in its present setting will not give more than from forty-five to fifty-five per cent.; fifty per cent, I should say, would be the medium.

Q. How much power do you mean that it actually gives now?

- A. About fifteen horse-power. It is rated at thirty horsepower.
- Q. Now the present wheel: we will call that the Whitney wheel. What is the diameter of that, — that in the brick mill?

A. I think that one is forty-eight inches.

Q. What is the power of that? What is the rated power?

A. Well, it is rated at twenty horse-power.

Q. Then there is another Whitney wheel, is there not?

A. Yes, sir.

Q. What percentage does that give — that Whitney wheel?

A. That Whitney wheel, I think, gives about sixty per cent.

Q. And the other Whitney wheel?

A. The other Whitney wheel is rated at fifteen horse-power. It is a forty-two inch wheel.

Q. And that gives how much power?

A. That has never been tested, to my knowledge. I should judge that that would give about ten horse-power, i. e., the paper-mill wheel. It is the paper-mill wheel.

Q. Now there are two of the Blake wheels beside the one men-

tioned above — a right and a left wheel?

A. Yes, sir.

Q. What is the power of those two wheels?A. They are rated at thirty horse-power here.

Q. How much do they give?

A. I think those come up to nearly seventy per cent. They probably give about forty to forty-five horse—the two together, forty-five to fifty.

Q. Now, Mr. Coburn, there used to be a canal (we see now the remnants of it) at the head of the present canal, down into the

Concord river — one made there years ago?

A. I think that was used as a raceway. They used the old-fashioned tub-wheel at that time — an undershot wheel.

Q. Now, what would be the expense of putting that in condition so that a wheel could be set there?

A. I suppose you could fit that up so as to make the canal fit for it and put a wheel down for about \$1,000.

Q. Now, what could a wheel be purchased for, to be used in

that canal, and how much power could be supplied?

A. Well, there are different kinds of wheels. You might get a high-cost wheel or a medium-cost wheel. I suppose a wheel built at Orange (I have never had much experience with it) that would give you 50 horse-power. It would cost you \$3,000 to \$4,000. There is one used up to Farrington's.

Q. Do you know where else it is used?

A. There is one used over at Acton in the powder-mills.

Q. Now, the first Blake wheel that you spoke of as furnishing about 50 per cent. — what would be the expense of replacing that with an Orange wheel?

A. Probably that could be done from \$800 to \$1,000, to put it in good condition. It would be difficult to tell without examining

the ground.

Q. By that you mean "putting the property in condition for the wheel"? You don't include the cost of the wheel?

A. No, sir.

Q. What wants to be done to make that more efficient?

A. It wants to be sunk down and to make more room for the

water to escape. It wants more vent.

Q. How much power could you get from a wheel that you could put in that position at that place; i. e., the first Blake wheel? First I take the wheel that was to be placed in the old raceway, which we call the old canal.

- A. The one we are speaking about now would be the farthest on the Concord river.
- Q. It is what we call the first Blake wheel the one you spoke of first the wheel that gave 50 per cent?

A. That is under the brick mill.

- Q. Now you can put in a wheel there. This was only 15 horse-power. How much horse-power could you get from a wheel in there?
- A. Oh, I suppose you could get 54 horse-power; that is from a high-cost wheel.

Q. How much would that cost?

A. Well, probably, seven or eight thousand dollars. This Orange wheel would probably cost about \$3,000. It is almost of the same power. There is probably about 3 per cent. difference.

Q. Well, in place of the two Whitney wheels I suppose you could put other wheels. Now, what would be the expense with

them?

- A. The best results I have known with a Whitney wheel is $66\frac{1}{2}$ per cent. There are wheels I know of that would give 80 per cent.
 - Q. How much would be the expense of preparing the land and

replacing the wheel in the case of the Whitney wheel?

A. It would not cost so much as where the Blake wheel is. If they were done together they could be done cheaper than if done

singly.

Q. Suppose, in place of the present Whitney wheels, you put in two Orange wheels. They would give you for each of them fifty horse-power. What would be the expense of preparing the place for them?

A. Probably the whole could be done for \$1,200.

Q. There is an island in this property, is there not, — an island in the river?

A. Yes, sir.

Q. Was there formerly a mill there?

A. There was a mill on the island there quite a number of years ago.

Q. And there is land on the other side of the river?

A. I think there never was a mill there.

Q. Is there land on the other side of the river?

 $ilde{A}$. I was not aware that there was — not claimed in the title there.

Mr. D. S. RICHARDSON. There is half an acre.

Q. Now, upon the side of the river where this canal is, and where the present works are, is there room for other mills?

A. I should think there was.

Q. To use all the room you can get there?

A. If they want to put up any mills there, there is plenty of chance to put them up.

Q. Plenty of room?

A. I should say so.

Cross-examination.

Q. (By Mr. Butler.) About how many effective horse-power in practice has been actually used there for some years past?

A. I don't suppose that they have actually used more than 75 or 80 horse-power, — that is, if you put a dynamometer on it to test it.

Q. How long have those wheels been running in this condition?

A. The two Blake wheels were first put in in 1863 — fourteen years ago.

Q. Before or after Mr. Richmond's death?

- Q. They were put in by Charles B. Richmond?

A. Yes, sir.

Q. The late husband of Mrs. Richmond?

A. Yes, sir.

Q. That is, after he had bought for \$9,500, he went and put in the two Blake wheels?

A. Yes, sir.

- Q. Charles B. Richmond was a practical manufacturer, was he not?
- A. I think not; he paid very little attention to it; he depended upon his foreman principally.

Q. Have they any steam there?

- A. No steam-power. They have steam for heating and drying.
- Q. The portion of those works that are usually run nights has been the paper-mill, I suppose?

A. Mostly.

Q. Whether they have in the dry time used up all their power there?

A. Well, I think usually they run them all the time. They

have usually run right along.

- Q. Has there not usually been water running to waste when the water is running over the dam above, or the wheels are going above?
 - A. Generally there has been water running to waste.

Q. Over Mrs. Richmond's dam?

A. I think so.

Q. (By Commissioner Francis.) When the mills have been running above, there has been water running to waste here?

A. Yes, sir.

Q. (By Mr. Butler.) Or when the water has been wasting over the Wamesit dam, which is the same thing?

A. Yes, sir.

Q. Now about the place to which they flow; did you ever know anything about the bolt in the rock, as between the Whipple privilege and the other?

A. I don't think I ever did — not to remember it. I have

heard of it, but I don't know as I ever saw it.

- Q. The Richmond dam does flow up upon a portion of the wheels of the Wamesit dam?
 - A. I presume it does, that is, in high water.

Q. That is to say, as you understand, the privilege would, in a considerable rise on the Richmond dam, be felt on the wheels, more or less, of the Wamesit?

A. It would, if they were old-fashioned wheels, and the water

did not rise above as much as it rose below.

Q. All I want to get is, whether the height to which the dam could be raised, or the right to raise the dam, would not be affected by the fact that raising it would flow upon the mill-wheels of the power above?

A. Undoubtedly it would.

Q. Then below, the Middlesex dam flows up on to the Massic wheels, does it not?

A. I think it does.

Q. So that the Massic Falls are between two fires, — they cannot lower their wheels on the one side, and they cannot raise their dam on the other, because their neighbors interfere with them if they do?

A. That is the way it is, I suppose. They have taken up all the water-power there is between the three places. I mean all the right of water-power is taken up. It would make no difference

whether it was one horse-power or ten thousand.

Q. My associate gets a different understanding from your testimony from what I do. Let us see how it may be. I understand you to say, that \$1,200 would cover the cost of arranging the flumes and water-seats for the Blake wheel and for one Whitney wheel; that \$1,200 was only for making the mill-seat and arranging the flumes and raceways?

A. That is all.

Q. That is the way I understand it. In addition to that, there would be then the putting in of the wheel, — whatever wheel you paid for?

A. Yes, sir.

Q. Then, in addition to that, would be the necessary shafting, I suppose, to carry the extra amount of power into the mills?

A. Yes, sir. Nothing is included in the \$1,200, except the

stone work.

- Q. You would expect, if you used that amount of power, to build new mills?
 - A. Unless you had something very heavy to drive.

Re-direct.

Q. (By Mr. G. F. RICHARDSON.) I understand you to state \$3,000 as the cost price of the wheel and setting both? Was I right?

A. After the pit is all ready.

- Q. So that, in other words, that \$7,200 would replace the two Blake wheels?
- A. Yes, sir; it would give you two other wheels in place of the Blake wheels. \$7,200 would give you two wheels, with 100 to 108 horse-power.

Re-cross.

Q. (By Mr. Butler.) I asked you if Mr. C. B. Richmond was a manufacturer, and you thought not?

A. You said "practical manufacturer." He understood the business of buying and selling and taking care of his property.

Q. He was a careful, shrewd business man, was he not?

A. Yes, sir; he was a good manager. Q. What was the height of Massic fall?

- A. I always reckoned it as eight feet. There are others that have measured it better than I have. I did not take a survey. It was from my observation.
 - Q. How many years? A. About fourteen.

Q. How much of that time? How many weeks or months?

A. I believe I have had occasion to measure it three times.

Q. Measure it yourself? A. Yes, sir.

Q. At high stages of the water?

A. Yes, sir; probably at high stages of the water. Q. You made it eight feet?

A. Yes, sir; probably sometimes a little above and sometimes below. It depends upon the height of the water and the water flowing back.

Q. You measured it three times?

A. Yes, sir; and it has been in the vicinity of eight feet. would take my old figures and look them over and see how they would compare. I did that in connection with work on the wheels, calculating the speed of the wheels and what speed would be required for use of the machinery.

Q. Since Charles B. Richmond's death have you put any wheels

in there?

A. No, sir.

Q. They were under him mostly, or some of them?

A. All of them.

Mr. D. S. RICHARDSON. The consideration given to the guardian having gone in, there should go in also these two mortgages, which existed at that time, and which I have here the discharges of.

Commissioner Russell. Do they go to change the consideration?

Mr. D. S. RICHARDSON. Yes, sir; the consideration is assumed to be for the selling of one-half of the estate. He sells all the right that he has for \$9,000. Now I show that at that time there were two mortgages amounting to \$10,000, which Mr. Richmond has paid since the conveyance. He sold just the right which they had, whatever that might be. This conveyance was made in 1863. These mortgages were on then, and were paid and discharged in 1866. The estate at that time had been settled; and the right at that time was the right irrespective of those mortgages. one of them is for \$5,000, making \$10,000; and the discharges are made in 1866. Since that time both of the discharges were made and recorded. The mortgages were paid by Mr. Richmond.

EDWARD A. COFFIN, sworn.

Q. (By Mr. G. F. RICHARDSON.) You reside in Lowell?

A. Yes, sir.

Q. And are a relative of Mrs. Richmond by marriage? You married her daughter?

A. Yes, sir.

Q. How long have you been connected with these paper-mills?

A. Since December 1st, 1871.

Q. You have leased the mill from some date, have you not?

A. Since Mr. Richmond's death. That was in 1873.

Q. When did Mr. Richmond die?

A. He died the 25th of August, 1873, I think.

Q. And since 1873 you have been the lessee of a part of this property?

A. Of the paper-mill part.

Q. What is the amount of rent?
A. Three thousand dollars a year.

Q. How much land do you have with that, Mr. Coffin?

A. I have the wooden and brick mills — forming the paper-mill property; and the land from the bridge over the canal, i. e., the land in front of the mills, and sufficient room outside of that for storage of coal and wood.

Q. How many buildings of all kinds are embraced?

A. Three, — one wooden mill, one brick mill, and one stone boiler-house.

Q. You make paper, do you not?

A. Yes, sir.

Q. And in making paper it is necessary that you should run nights as well as daytimes?

A. Yes, sir; all paper-mills do.

Q. Now, how much power do you use in your works?

A. Well, I get at my power merely from what I judge with regard to the power that it takes to drive the machinery — from what has been told me by people of good authority; merely that.

Mr. Butler. If he tells us which wheels he uses, then we know from Mr. Coburn, don't we?

The Witness. I have four pulp engines, of which the roll-bars are twenty-six inches; and it takes eight horse-power to run one of those; making thirty-two horse-power there. Then I have one pulp-engine of thirty-six inch roll-bars, which it takes twelve horse-power to run. When I say that it takes twelve horse-power and eight horse-power, I merely mean that I am told so by people who run that machinery. Then I have in addition to that a fan-pump, which raises the water to a height of fifteen feet, and that ought to take five horse-power. I have one rag-cutter and one rotary-boiler, and a grindstone, and two or three things, — which it takes about ten horse-power to drive — to drive the extra odd machinery. All these things are driven by the two Blake wheels in the paper-mill.

Q. You don't have any other wheel?

A. Yes, sir; one other wheel, which is a Whitney wheel, which drives the paper-machine, which makes the paper, and which drives the pulp-stirrers. All that machinery was in the first place driven by the two Blake wheels. I have I say one Whitney wheel which drives the paper-machine and the stirrers of the pulp-chests.

Q. How much power for that?

A. Well, not over fifteen horse-power.

Q. Now part of the premises is rented to somebody else?
A. To William Walker & Company.

Q. What is leased to him?
A. Two mills, — one brick mill and one stone mill, — having in them one Blake wheel and one Whitney wheel.

Q. What is the rent of those mills?

A. He pays \$2,800 rent. He is on verbal time now. His lease expired on the tenth day of October. He is simply holding over. The old lease I have at home. You can have it if you want it.

Mr. BUTLER. It will tell more exactly.

Q. How much power does he have?

A. I think he is guaranteed by his lease thirty horse-power.

Q. What does he manufacture?

A. He manufactures flannels, tweeds and cassimeres. Q. Can you tell us what his machinery consists of?

A. He runs what is called a four-set mill, with all the necessary

appliances.

Q. Mr. Coffin, there is a place there where there was formerly a raceway, that Mr. Coburn referred to, and which could be altered into a canal, I suppose?

A. Yes, sir.

Q. And room enough within the enclosure to erect any number of mills?

A. Plenty of room.

Q. Room enough to run all the power you could get there?

A. Yes, sir.

Q. How much land on the other side?

A. There is half an acre.

Q. And the island is included?

A. Yes, sir; the island belongs to the property. Q. Formerly there was some structure on the island?

A. There was a mill there, I have been told. It has not been there since I have been there?

Cross-examination.

- Q. (By Mr. Butler.) Mr. Coffin, do you think your rent a fair one?
 - A. Yes, sir; I think it is fair compared to other paper-mills.

Q. Does that include the machinery?

A. Yes, sir; it includes the use of the machinery.

Q. And the land and buildings?

A. Yes, sir; of course I make the repairs.

Q. Does Mr. Walker make repairs?

A. Mr. Walker owns all the machinery. Mrs. Richmond only owns the water-wheels and main lines of shafting in the mills. She also owns the mills.

Q. How many buildings have water?

- A. Two, sir. There is a stone boiler-house connected with the brick mill, which he built himself, to put a boiler in for his own use.
 - Q. His lease was on a term of years?

A. Yes, sir.

Q. How many?

A. Seven.

Q. That was made by Mr. Richmond?

A. Yes, sir; that was made by Mr. Richmond. Mr. Walker had been there before that, but the last lease was for seven years.

Q. The last lease which expired was for seven years?

A. Yes, sir.

Q. Now how large is that brick mill?

A. Well, sir, I never measured it, and I never was told; but I should think it was 50 feet by 25.

Q. How many stories high?

A. Three stories, and an attic and a basement.

Q. A well-built mill?

A. Yes, sir.

Q. Any place for a counting-room?

A. No, sir; his counting-room is connected with the stone mill.

Q. How large is the other mill?

A. The stone mill, I think, is 60 by 30.

Q. How many stories?

A. Two stories, a French roof and a basement on the back side, making a whole story on the back side, and a basement on the front.

Q. What should you say would be the fair worth of that stone mill?

A. Well, sir, I am not competent to say at all, because I never had any experience in building property of that kind whatever. I could not possibly estimate it.

Q. I suppose you can make me the same answer about the brick

mill?

A. Yes, sir; it is something entirely foreign to anything that I ever had anything to do with.

Q. Is your lease on a term of years?

A. No, sir; I hold my lease from one year to another. It is renewed yearly.

Q. Have you got a written lease?

A. No, sir.

Mr. D. S. RICHARDSON. He is only a tenant at will.

Mr. Butler. I was only inquiring to see if the title would be all quiet for the next year.

Q. You would not come and ask us for damages?

A. I have no right to.

Q. Have you ever known, since you have been there, reclamations made on the Middlesex Company, or payments made by them

for throwing out your wheel?

A. Yes, sir; the Middlesex people bought a right, as I understand it, several years ago, for the privilege of erecting flash-boards six months during each and every year, for one hundred dollars, from the first day of June to the first day of December. I have known them in times of dry weather, either before the first of June or after the first of December, to pay Mr. Richmond a certain sum per day for the privilege of retaining the flash-boards on, or putting them on before it was the time that they should do so.

Q. Flash-boards put on when the pond is full you feel pretty

sensibly on your wheel?

A. Yes, sir; the moment they are put on it flows back above the

apron of the wheel.

Q. And on the other side there is a bolt fixed between Mr. Richmond and Mr. Whipple, in a stone, which will regulate the height of the flash-boards there?

A. There is a letter "P," sir, on the rock on the southerly side, regulating the height of the dam, and a cross regulating the

height of the flash-boards above that.

Q. Why should it be a letter "P"?

A. I cannot tell you; it is in all the old deeds. It is from some of the old owners.

Q. Were those marks both ancient?

A. Yes, sir; they have always been there, so far as I know anything about it.

Daniel Coburn, recalled. — Cross-examination resumed.

- Q. (By Mr. Butler.) You told us you were conversant with that property and that you were a mechanical engineer and were familiar with putting in wheels, and all that. I want to get your view of the worth of those mills. We will commence with the Walker stone mill: what would be a fair cost of that to build it by the day?
- A. I have never looked over the property to see how it is constructed, I am sure. It would be a delicate matter, unless you looked over it for the purpose of seeing how heavy the walls are.

Q. Assume that they are well built, of course. They were built

by C. B. Richmond?

A. I think the stone mill was. The brick mill, I think, was built by B. O. Richmond, his predecessor.

Q. Assume that they were properly built for such a building,

give an approximate estimate?

A. It is a matter that can be so easily estimated by looking the property over that I dislike to give an opinion as to what it might be. You might get it a third more or a third less.

Q. We must take, then, if we get it within 33 per cent. I only want to get some information. Give your best judgment.

A. Probably about \$8,000 for the Walker stone mill—the building, without the machinery.

Mr. D. S. Richardson. We don't own the machinery, except

the main shafting.

Q. How much would it cost to build the brick mill that Mr. Walker has got?

A. Do you mean to take that clear down to the foundation, or

where it is built?

Q. I mean, supposing it was not there, what would it cost to

build the building?

- A. Well, that would be something less I should say, but not more than four or five hundred dollars less; we will call it \$7,500. That is the Walker brick mill. I don't intend to include any of the shafting in that estimate, nor the water-wheels.
- Q. The division I make in my own mind, is "water-wheel and shafting, and the way to get the power." Now take the paper-mills. I think Mr. Coffin told us there were three mills. Give them in your own way and tell me what you say the first one was worth?
- A. Well, the engine-room and the rotary bleach I should include all in one mill. I don't know how he would include it.

Q. Well, put it so?

A. He is right here himself, and he just built it. He ought to

answer those questions by the book.

Q. I asked him, and he said he was not used to it and could not tell. I am trying to get at a fair valuation of the property, if I can. I don't want you to inflate it on the one side, or scrimp it on the other; but give a fair, honest valuation.

A. Well, for that mill itself, I should think about \$8,000, per-

haps, would do it.

Q. How in regard to the other mill connected with the paper-mill?

A. Well, I guess \$6,000 would fix that.

Q. Any other building connected with the paper-mill?

A. The brick chimney for making the steam for heat. Probably it would cost \$1,500 to build that chimney. Then they have a store-house on Lawrence street.

Q. What is that worth? A. That is worth \$5,000.

Q. So that you consider about twenty thousand five hundred dollars as the value of the paper-mill, or what we call the paper-mill?

A. Yes, sir.

Q. Do you know anything about the worth of the paper machinery of itself? Give me your opinion of what the machinery would be worth as it is in that mill, for making paper?

A. Well, one of those small engines probably could be built for a thousand dollars, and there are four of them there; and a large engine probably would cost two thousand dollars.

Q. Now, the other machinery?

A. It depends on the calender rolls, something about the machines — what order they are in. I have not noticed them of late.

- Q. Assume them to be in good order and condition, what then?
- A. For the paper machines \$4,000; or \$4,500, if the calender was in good shape.

Q. Would that include all the machinery in the mill?

A. No, sir; it would not include the shafting.

- Q. I mean for you to leave out the shafting always.
- A. That leaves out the shafting, and pulleys, and belting.

Q. Does that include the boiler and the heating?

A. No, sir; that does not touch the bleachers. Those bleachers can be built for about \$2,000. That includes the gearing for trying any other machinery in the mill. There is a kettle.

Q. What it that worth?

- A. Probably three hundred dollars. Q. Any others that you think of?
- A. I don't think of anything else, except the pulp-chest. There is an agitator inside of the pulp-chest that keeps the pulp stirred up.

Q. Did you put that in, in addition?

A. Those are cheap things. They more properly belong to the shafting than to the machinery.

Re-direct.

Q. (By Mr. D. S. RICHARDSON.) This does not include the value of the shafting, you say, nor the water-wheel?

A. No, sir; nor the steam boiler for heating up. That I said

nothing about.

Q. (By Mr. Butler.) Didn't you include the steam boiler?

A. No, sir.

- Q. (By Mr. D. S. Richardson.) How much is that extra? What is that worth?
- A. I think those can be got for about \$1,200 now. I am not particularly well posted as to the size of it. Probably \$1,200 would buy boiler and pipe and apparatus. Probably \$1,500 or \$1,600 would put it in good shape, I think.

Q. (By Mr. G. F. RICHARDSON.) How much land is there in

the island? What should you say the contents were?

A. I should think the contents would be in the vicinity of half an acre.

Q. Now on the side of the river where the works are — how

much land should you think there was there in all?

A. Well, I should think there would be two acres — perhaps a hundred thousand feet. It is a little more than two acres.

Q. There is vacant land on each side, is there not?

- A. Yes, sir; I never viewed it for the purpose of taking the dimensions, how much there was.
- Q. Didn't you look at it with a view to seeing where you could set other mills, for the purpose of using the power?

A. Not particularly. I never did.

Q. According to your memory, is there vacant room enough to contain mills enough to use all the power?

A. Yes, sir; plenty to use up all the water-power there is there.

JOSEPH P. FRIZELL, sworn.

Q. (By Mr. D. S. RICHARDSON.) Have you made some measurements of the Massic dam in Lowell — the Massic falls?

A. I have made measurements of the dam.

Q. And of the water?

A. Yes, sir.

Q. Won't you give an account of the results of your measurements of the water, and state over what period of time they extended?

Mr. BUTLER. Have you not had all that in?

Mr. D. S. RICHARDSON. No, sir; we didn't have in the items. You put in the results. I understood it was not in; that the result was that of a measurement made at Massic falls. The result gave a minimum constant of so much. The paper itself was not put in.

Commissioner Russell. I think he also deducted Meadow brook. Whether he gave us Massic falls or the deduction or not,

I don't know.

Mr. D. S. RICHARDSON. We will have it in.

The Witness. The figures I gave you will require a little modification for Mrs. Richmond's dam, on account of drawing nights at the upper dam.

Q. Now won't you give us the table that shows the modifi-

cation?

A. I can give you almost anything you can ask for.

Q. Have you got any paper made up that showed these results, without your stopping to give the details?

A. No, sir; I have not.

Q. I thought we had a paper from which we took the measure-

ments three times a day of the water from the dam?

- A. I gave it to you from these results in my hand; and I gave you what I thought would be the quantity to be depended upon at Massic falls and Wamesit dam.
- Q. Give in your own way the results, stating over what period of time the measurements extended?
- A. My measurements extended from the 24th of August to the 25th of September, including part of each of the outside days.

Q. Now, will you give the results at the dam? Did you make

a measurement of River-meadow brook?

A. Yes, sir.

- Q. So as to separate it from the waters that came down Concord river?
 - A. Yes, sir.

Q. Now, won't you give the results that you came to, in your own way, separating the water of Meadow brook from the other?

What result did you find?

A. I believe I said that the quantity that could be depended upon at Wamesit dam, at the present condition of things, was 180 cubic feet per second, assuming that the diversion has already taken place. That was about 180 cubic feet per second while the

mills were running — for the running time. At the Massic falls,

we get, in addition to that -

Q. [Interrupting.] Do you mean that that computation included the water that would have been supplied by the Sudbury or excluded it?

A. Excluded it.

Q. Now, what could be depended upon at the Massic falls would be in addition—the quantity drawn at night at the Wamesit dam, and the quantity passing Hale's brook. The same quantity could be depended upon at the Massic falls?

A. Yes, sir, during the day, and also a considerable quantity

during the night.

Q. How do you fix the night quantity, and why?

A. I have got the quantity that was passing at night during each of the several days that my measurements occupied.

Q. Well, how much would that give you -- increase?

A. [After referring to calculations.] There was passing at night at that time, previous to the heavy rain, all the way from 55 to 95 cubic feet per second.

Q. That is the water passing the Wamesit dam at night?

A. Yes, sir. That was at Wamesit dam. The quantity passing Meadow brook at the different times I have given.

Q. How much was that? Repeat it in this connection. How could you get 55 to 95 cubic cubic feet per second? You merely

find so much water coming from the same sources?

A. That was the quantity passing Massic falls dam, excluding what came from Hale's brook during the night. The Meadow brook afforded from 3 feet up to as much as 18. All along until the 18th of September the brook afforded from 6 or 7 down to 3 cubic feet per second—up to the 18th day of September, the day there was a rain. When we commenced it was not much above 6 cubic feet per second. By the 18th of September it had got down to not much over 3 cubic feet per second. It had gone down from the time we commenced.

Q. What was it during the rain? The rain came on the 18th, and you finished on the 25th. Won't you give it — what it was during that time?

Mr. Butler. All that is in at great length, every measurement,

night and day.

The WITNESS. It went up to about 18 feet.

Mr. Butler. I have got it in my memory as 22 feet.

The Witness. That was the highest quantity, but it was only for a very short time. I said that eighteen cubic feet would be about the average. It would be more than that. The highest average for any day would be nearly 30 cubic feet. That was the 19th of September.

Q. The highest possible was 32 for any day, as you testified to

before, or substantially that. What is the highest of all?

A. The very highest figure that I perceive here is at 9 o'clock on the 18th of September — 9 o'clock in the afternoon. That is put down as 38.9 cubic feet per second. That was only the result of one observation.

- Q. Is there anything further in connection with River-meadow brook?
- A. You can form some idea of the rapidity with which the water fell off after the rain.

Q. Will you give that? A. The general average for the 22d of September would be about 14 cubic feet per second.

Q. How was the 25th? The 25th only included a part of the

A. On the 24th the flow was affected by the dam. It afforded from 12½ down to less than 2 during the day. That was on Sunday. The 24th was Sunday.

Q. Is there anything farther that you can add as to giving River-

meadow brook — anything that you think of?

A. I don't think there is.

Q. Now, I think we had something of the same confusion before as to including and excluding the diverted water. In making your estimate of 180 cubic feet per second at Wamesit dam, you excluded the water that has been diverted from the Sudbury river. You didn't reckon that in at all?

A. No, sir; I didn't count that in.

Q. Then you arrived at that result from these measurements made at the Massic falls, taking out the quantity of water supplied by River-meadow brook, did you?

A. The quantity that I gave for Wamesit dam excluded the

River-meadow brook.

Q. (By Mr. Butler.) The River-meadow brook and Sudbury river?

A. Yes, sir.

- Q. (By Mr. D. S. RICHARDSON.) Now, I want you to state what was the quantity of water, over this period of your measurements, as you exactly found it at the Massic falls. Give the result as to Massic falls which you have now already given as to the Wamesit dam. How much was that?
- A. The result I gave for the Wamesit dam is the quantity that would pass Massic falls during the daytime in the present condi-

tion of things.

Q. That is 180 cubic feet?

A. Yes, sir.

Q. I wish it at River-meadow brook, taking the whole?

- A. It is difficult to say how much could be depended upon from River-meadow brook, not knowing the way in which the water is held back.
- Q. What I ask you is, whether this same amount that you fixed for the Wamesit dam would be the same for the Massic dam, on your calculations and observations?

A. It would; and you would have the water-shed of River-

meadow brook in addition to and beside that.

Q. Now, will you make an approximate estimate, from this period of measurement, of what the River-meadow brook would furnish, or what it did furnish during that time, as near as you can?

A. I think that the period included in our measurements was

rather an abnormal one. Mr. Butler's mill was burned and undergoing repairs. The water was not held back as it would have been if his mill had been running.

Q. You mean Mr. Hale's old mill, don't you?

A. Yes, sir; up to the Bleachery.

Q. The water was not held back there at that time?

A. No, sir.

- Q. I should judge, if the water was held back there, that there would be considerable more available at Massic falls for use during the daytime. Of course they would get it all at one time or another?
- A. I should say at Hale's brook there would be, to be depended upon, between three and four cubic feet per second, at all times of the day and night.

Q. You were there more or less during 1861, and have been

there since?

A. Yes, sir.

Q. You know where the water is taken by the new plank flumes? It is all taken by a canal, is it?

A. Yes, sir.

- Q. Now, is there any place there where another canal could be built, or has been built? Describe its condition and what it would cost to put it in use.
- A. It appears from existing walls that there has been an additional canal between the present canal and the river. Undoubtedly another canal could be put in there.

Q. How much would it cost to construct that canal? Does that

go to the dam — does the head of it go to the dam?

A. Apparently it started from the dam.

Q. Now, did you make some observation; and, if so, what do you think it could be put there for, so as to conduct water from the top to the bottom of the falls?

A. I merely looked at it. It would be very easy to put in

another wheel or two there. It would not be expensive.

Q. Enough to furnish how much power, should you judge?

A. As far as the wheels and races are concerned, it might furnish any amount of power, I think, that the river could supply—such as from 50 to 100 horse-power.

Q. What would be the expense of fitting the canal and putting

in a flume? Did you have some idea in your mind?

A. It was very indistinct.

Q. How much should you say?

A. I should say, so far as the race and gates, etc., are concerned, that it might be done for \$1,000, in the same manner as to permanency as the other works are done.

Q. Whether or not there is a place excavated or made at the foot of the falls where the wheel could go in already with little

alteration?

A. I should think there would be very little extra work in put-

ting in a wheel there.

Q. Did you observe whether there was vacant land enough around to use any reasonable amount of power if you should build a mill?

A. Oh, yes, sir, I should think there was.

- Q. Are there any other figures that are of importance, that you think of?
 - A. I don't know that there are.
- Q. (By Mr. Shattuck.) I should like to ask one question to save recalling Mr. Frizell in the next case. Here is a deed from Warren, Barry and Park to one Eager, bearing date January 2d, 1832. Have you examined the water that would run through that aperture of two and one-half inches by ten described in that deed?
- A. The aperture is said to be twenty-four square inches, and it is also said to be ten inches wide by two and one-half inches deep. I stated that the head here was about eight feet. Assuming that to be the fact—

Q. [Interrupting.] Do you know what the head there is?

Mr. Butler. I object to the question. No man can tell how much water can run through a hole two inches by ten unless he knows how much the pressure is.

Q. Assuming a certain head, the question is, how much water will run through a hole of certain dimensions? Will you state?

A. Assuming the head to be eight feet, it would discharge two and one-fourth cubic feet per second.

Q. How much power would that furnish in the machinery at the fall on that dam? State about how many horse-power.

A. With a nine-foot head it would give something like one and three-quarters horse-power, with ordinary wheels.

Q. Do you know what the head is on that dam by measurement? Did you examine it?

A. I ascertained; yes, sir. I believe I have given that.

Mr. Shattuck. This is simply for the other case, to avoid recalling the witness.

The WITNESS. Did I give the fall at Mrs. Richmond's?

Mr. D. S. RICHARDSON. No, sir, you did not. At the time that you measured that what was it?

Mr. Butler. Are you not satisfied with eight feet?

Mr. D. S. RICHARDSON. Yes, sir.

A. It is all the way from seven and one-quarter to eight feet.

Commissioner Russell. My associates suggest that this witness has the actual flow of Concord river at Massic falls, including River-meadow brook, for a certain period, and that that is not in this case.

Mr. D. S. RICHARDSON. That is what I was afraid was not in before; and it was not put in. I knew there was difficulty about that. As I understood it, when I wanted those results put in, when they were examining him before, he gave certain results from those measurements which were here. I had a copy of that table in my pocket, and there were some used by the other counsel to get the data from which this result was put in. Then something was said about putting that in, and they said "not at that time," and it was postponed. So, as I understood it, while the result he gave from those measurements was put in, the measurements themselves for the several days during that time were not put in. They subsided, to be considered hereafter.

Mr. Butler. I think it will be found, if you will allow me to

cross-examine, that they are in.

Commissioner Russell. Go on with the cross-examination, and leave that matter for the future.

Cross-examination.

Q. (By Mr. Butler.) Mr. Frizell, at the same time that you were measuring, Mr. Herschel was measuring, was he not?

A. Yes, sir.

Q. Have you examined his measurements during the time that you were examining?

A. Yes, sir.

- Q. Have you found any substantial difference between his measurements and yours?
 - A. No substantial difference. There was a little difference. Q. Anything more than any two measurers would make?
- A. Probably not by using different methods of ascertaining the depth on the weir.

Q. You only measured one side of the dam—the running of

the water from one part of the dam?

A. I supposed I got the amount of the water throughout the whole length of the dam.

Q. Did you make it more or less than he did?

A. I think I made it somewhat more.

Q. You didn't measure at the other end of the dam which was acting as a weir. You didn't measure at that end at all, did you?

A. I measured the height of the surface of the water at a point above the dam, where it was substantially still and unaffected by the discharge, and that applied to the whole length of the dam.

Q. You measured upon one side, and assumed the height of the dam at that side to be the level of the dam clear across?

A. I took the level of the dam clear across several times.

Q. Was there any substantial difference after all?

A. During the lowest period I think that we differed three or four cubic feet.

Q. In how long?

A. Three or four cubic feet per second. That was about the average difference, I judge, as far as I can give it from memory.

Q. Very well. Otherwise the tables are correct, so far as you know?

A. Yes, sir.

Q. Now, Mr. Frizell, I desire that you will do this for me: take from the 24th of August to the 24th of September, inclusive. It will give us thirty-one days, will it not?

A. Yes, sir. The measurements terminated on the 25th of

September.

Q. It will give you thirty-one days, clean, which will be to the twenty-fourth, inclusive; and make a table showing the actual amount of water running during the twenty-four hours over Massic falls; also show the amount of water running in Rivermeadow brook in twenty-four hours—the average of those thirty-

one days — each twenty-four hours separate. For each day there is an average, and so much running over Massic falls, and so much running over River-meadow brook. That will give the whole amount, will it not, of what was coming down from the Concord?

A. Yes, sir.

Q. Please make me a table, first showing the average amount of water per second flowing over the Massic dam, by your measurement, the average for each twenty-four hours flowing over the dam from August 24th to September 24th, inclusive. Also give the amount flowing during that time on the same days at River-meadow brook. Put those in separate columns. Then in another column put the amount, as taken from our measurements of the Sudbury river, of the amount diverted during that time. Then in another column give us what the amount of the aggregate of the two would be, i. e., the water flowing over the dam at Massic falls, deducting River-meadow brook and adding Sudbury river, as found by our measurement, allowing three days for the water to come down.

Mr. D. S. RICHARDSON. And I should like on that table some memorandum that the water of the Sudbury is represented as coming three days afterward, so that the table itself will show it.

Mr. Butler. Understand me. I mean the amount diverted by us, because some days we could not divert the whole of it.

Q. (By Mr. Butler.) Do you understand what I want?

A. I believe so. Yes, sir.

Q. What I desire is, to get the actual amount diverted during that time by taking the water of Sudbury river—the actual amount flowing at that time—deducting the amount of Rivermeadow brook.

A. Yes, sir. I think I understand it.

Q. Now, then, will you give us what the amount of effective horse-power will be that 180 feet per second will give over an 8-feet fall?

A. I can give you an approximation. [Makes calculation.] Mr. Butler. You can give us the effective amount, and then we will take twenty-five per cent. from it, or whatever you think ought to be deducted.

The Witness. [After making calculation.] It would not be

far from 120 effective horse-power.

Q. (By Commissioner Francis.) That does not include, then, the Meadow brook?

A. No, sir; that is simply 180 cubic feet per second.

Mr. Butler. To make this table still more valuable which I ask you to prepare, will you give, in another column, after having ascertained the flow of Concord river in the way I have indicated—will you give the amount of horse-power each day that they would have over an eight-feet fall at the Massic falls?

Q. (By Mr. Shattuck.) I should like to ask you one question only: whether the fact that on any particular day there might be one-tenth as much water flowing in the Sudbury river as there is in the Concord river, at Wamesit dam would be of any substantial

value in determining the proportions which are furnished during the year, over the Wamesit dam?

A. I should think not.

Q. (By Mr. D. S. RICHARDSON.) I want to ask you how many times in the day you made a record of these measurements?

A. Three times in two hours, — thirty-six times a day.

Q. Would you make any table of measurements that would be of any benefit here, — the table made out of the different measurements, would that be of any use?

A. It would help give you the facts.

Q. You made such a table, didn't you?

A. I don't think I did.

Q. Didn't you give Mr. Storey one, with this data, taken three times a day?

[No answer.]

Mr. D. S. RICHARDSON. That Storey matter goes with that paper. It may meet our wants as furnishing a table of those measurements.

Q. Could you make a table of your observations, giving sub-

stantially the whole?

A. I could put the facts contained in this table into a more accessible form, so that it could be printed with these papers.

Q. Will you please to do it?

A. Yes, sir.

Q. How long would it take you, sir?

A. Oh, the work that is laid out might occupy me for a day or two.

Mr. Butler. I think the table I have already asked of him will

give everything.

Q. (By. Mr. Butler.) I want to ask another question now upon another subject: Assume that you knew precisely how much water ran in the Sudbury river for three months, and that you knew precisely how much water ran in the Concord river during those same three months, would not the knowledge, — while the amount of water shown which you know runs in the Sudbury river, might not show with accuracy how much would run in other years during the same months, — whether you, as an engineer, believe, use, and act upon that knowledge of the amount of water running in the Sudbury river, as the very best criterion of how much it furnished to Concord river in that time?

A. It would certainly be conclusive as to the aggregate contribution of Sudbury river. But you could not assume that the water furnished by the Sudbury river reached Massic dam within

three days, or within ten days.

Q. What I want to get at is, whether the knowing for three months the exact amount of Sudbury river, and knowing the amount running in the Concord river, would not be the very best means attainable by an engineer for getting at the amount of water in the aggregate which the Sudbury river furnishes to the Concord?

A. Yes, sir, as an aggregate.

Mr. D. S. RICHARDSON. That is asking him whether twice two are four.

Q. Now then, sir, having that in a given year, — a measurement in a given year of the exact amount of water which flows in the Sudbury river during three months of the dry season, — and having the average of the rainfall at the nearest point to Sudbury river during that time, won't a calculation for a series of years of the rainfall at the same place, taken in connection with the amount so ascertained of the waters of the Sudbury river, be a very valuable means of ascertaining the aggregate amount of water which flows into the Concord from the Sudbury during the years in which you calculate the rainfall for the same months?

A. Assume that you have measured the Sudbury for three months in one year, you have measured the Concord also, and you have got records of the rainfall for that year and a series of years in the basin of the Sudbury and of the Concord, now you want to know if that would be a reliable means of predicting the

flow?

Q. The contribution of the Sudbury to the Concord for any of the series of years, for the same months for which we have the rainfall?

A. It would certainly be very valuable in that point of view.

Q. Is it not the best thing you can have?

A. I think that it is — the best you could obtain in the period

you are speaking about.

Q. (By Mr. Shattuck.) Take the amount of the contribution by the Sudbury river to the Concord as of course the amount that flows from the Sudbury into the Concord; you so understand it?

Mr. Butler. I object to this examination at this time. Brother Shattuck put in as much as he chose about the value of this method of measuring it, and stopped; I then cross-examined upon that question, as to the value of that method of measurement, and I stopped.

Mr. Shattuck. I beg your pardon, I think you did not.

Mr. Butler. Now, if my brother goes on again, I must go on again, and so on ad infinitum. I am approaching old age and I want to finish this case before I die.

Commissioner Russell. It is a little difficult to say when either side stopped upon this question. If Gen. Butler says he stopped this morning, it seems to me he began also this morning.

Mr. Butler. I mean that I cross-examined upon their re-ex-

amination, and that is the limit.

Commissioner Russell. I think the question as to one day is so different from that in regard to three months, that it can

hardly be considered the same.

Q. (By Mr. Shattuck.) Whether the value of the contribution of the Sadbury river at Wamesit dam does not depend rather upon the average of its whole contribution during any period, than upon the contributions for any particular day, in your judgment? That is the point.

A. It certainly depends upon the average contribution — upon

the average contribution that appears at the Wamesit dam.

Q. Then if you were to determine the value of the Sudbury river contribution to the Wamesit dam, would not the better way

be to take the whole average contribution of the Sudbury river, and distribute it over the whole period? I don't mean to say absolutely, but in general terms - distribute it over the whole period rather than to take the contributions for any specific day.

A. Well, the contribution, particularly when the Sudbury is very high — the contribution of one day does distribute itself over a

great number of days in the Concord.

Q. (By Mr. Butler.) Now, would you not in three months' observation of the dry time get a fair effect of the average flow of

the Sudbury into the Concord?

A. It would depend very much upon the rains that would occur immediately before the commencement of your three months' observation.

Q. It will depend upon the rain just before?

- A. If heavy rains had occurred not long before the commencement of your three months, it might affect the result very much.
- Q. But you would ascertain in the course of three months what that effect was, and bring it down to an average, would you not?

A. Yes, sir; you would ascertain that effect.

Q. You think, do you not (to illustrate this), that you have got substantially what the average flow of River-meadow brook will contribute to the Massic dam? You have got that, have you not, so that you can give it to us in such a way that we can rely upon it?

A. No, sir; not yet. I have got the average flow. I have given what you would call the minimum flow pretty accurately.

Q. Do you mean by the low-water flow, the low water at the dryest day, or the low-water flow for the month?

A. What might be called the low-water stage of the brook.

Q. And you think you have got it accurately enough to give an opinion, by thirty days' examination?

A. I stated so in that case.

Q. Although for a portion of the thirty days it afforded from three to thirty-six feet?

A. Yes, sir.
Q. Very well, then. Will you tell me why the flow of the Sudbury river could not be got as accurately during the dry stage of the river, by the three months' measurement?

A. If you are speaking of the flow at the city dam at Fram-

ingham —

Q. [Interrupting.] Yes, sir; I am speaking of the flow at the city dam. Let us come right to that. Is there any reason why three months of actual measurement will not give you the actual flow of Sudbury river during those three months, at Massic dam?

A. None at all; i. e., you could get it just as accurately at

Framingham dam as you could at Meadow brook.

Q. Three months would be as valuable as one?

A. Yes, sir.

Q. Now, then, having got the amount which would flow into the Concord at the city dam, can you tell any reason why that will go down there in one year more than another, in the dry season of the year?

A. No, sir.

- Q. Go down to the Wamesit dam in one year more or less than in another?
 - A. No, sir; I don't know that there is any reason.

Q. I will not trouble you any farther.

A. It will all get there sometime.

DANIEL COBURN, recalled.

Q. (By Mr. G. F. RICHARDSON.) I thought there might be some confusion in getting at the amount of horse-power furnished at the various wheels, from the fact that it was put in by percentage. Now, I want you to give us the actual power that can be furnished by each wheel just as they are, so as to prevent any possible confusion by reason of the rated power. The first Blake wheel you called how much power?

A. Fifteen horse-power.

Q. The second how much?A. Eleven and twenty-two one-hundredths.

Q. Third, the Whitney wheel?

A. Ten horse-power.

Q. Then the two Blake wheels — how much horse-power each?
A. Well, I should think by the machinery they were driving, that there ought to be thirty horse-power each.

Mr. G. F. RICHARDSON. That makes 96.22.

Mr. D. S. RICHARDSON. I have nothing further in the way of evidence, except that I should like to have this table put in, in some form, which we used in the examination before, when the results were given. Perhaps it will give what is required. If it does not, I should like Mr. Frizell to furnish that table after he has furnished the one asked for by Gen. Butler.

Mr. BUTLER. I have nothing in the Richmond case. We put

in our measurements in the Massic dam before.

Mr. Shattuck. The table which we proposed to put in by Mr. Frizell is this. It has just been brought by Mr. Storey. It is the quantity of water furnished at the Massic dam in 1866. The first claim is the average during the day. The second claim is the average while the mills were running; and the third claim is the average while the mills were not running. That gives those three tables. This one which is marked "J. P. F. 3," applies to Wamesit dam.

[Mr. Shattuck puts in the table prepared by Mr. Frizell, marked "J. P. F. 3," and calls upon Mr. Frizell to testify in regard to it.]

Joseph P. Frizell, recalled.

Q. (By Mr. Shattuck.) Were those tables prepared by you?

A. Yes, sir; they are what they purport to be by the description given upon the tables themselves, — the headings and captions.

Q. (By Mr. Butler.) What has been torn off that sheet in the corner where I indicate?

A. I don't know. I did not tear anything off of it.

Q. What was on it before it was torn off?

A. I don't know. I don't know that there was anything there. There is paper torn off.

Q. It is torn off in the "Remarks" column?

A. I don't know anything about it. I did not tear it off.

Q. Don't you believe there was something on that piece that is gone?

A. I don't remember anything.

Q. You don't remember whether there was or not?

- A. I don't think there was anything. It might have been headed there "Remarks."
- Q. I know it *might* have been headed something. That is no the point. Was that paper whole when you prepared it?

Mr. Shattuck. I tore it off.

Mr. Butler. I wish you would produce the piece.

Mr. Shattuck. It was a private memorandum that I did not care to put in.

Mr. Butler. Was it made by Mr. Frizell?

Mr. Shattuck. Yes, sir, it was.

Q. (By Mr. Butler.). What was that memorandum, Mr. Frizell?

A. I have not the slightest idea.

Mr. Shattuck. I don't know that I am under any obligation to put it in.

Mr. Butler. I have no question about your obligations. I

only want the facts.

Q. Can't you tell what that was, Mr. Frizell?

A. I cannot at present.

Q. Let me see if I can't find out. Did you make two copies of this?

A. I think there were two or three made.

Q. Given to each of the counsel?

Mr. D. S. Richardson. I have no copy of my own.

A. Not to my remembrance.

Q. Whom did you give them to?

A. I recollect giving two to Mr. Storey. I left one at his office.

Q. Two to Mr. Storey and one to Mr. Shattuck?

A. I have no distinct recollection about giving one to Mr. Shattuck; but I think I did.

Mr. Shattuck. If this were before a jury, I should state exactly why this was torn off; but I don't propose at present to do so. You will probably get it by and by, General, if you want it, and the reason why it was torn off.

Mr. Butler. I object to the statement.

Q. Now, we will take the first day, Tuesday, August 24th. Under the head of "Average during the day," is that the exact average that your measurements show ran over Massic dam?

A. I think it purports to be.

Q. Look and see. Let us see your profile?

A. I did not have any profile. [Referring to table, and read-g.] "Thursday, August 24th." That included part of the day ing. only.

Q. What measurement have you of the amount that ran over August 24th, — that shows 171.54?

A. The average of the time that it was observed during the

day?

Q. Take any figure of your measurements and make out that average if you can.

- A. There are a great number of results.
 Q. There cannot be a great number of results in that day, only thirty-six; and if you only averaged a part of the day there will be less.
- A. The average of the results observed for that day was 171.54 cubic feet per second. We commenced at 10.45, and went to midnight.
 - Q. Average while the mills were running?

A. That I had 235.64.

- Q. Have you any measurements to show for any more than half of the day while the mill was running?
 - A. It shows from 10.45 until the mill stopped. Q. "Average while the mills were not running"?

A. That was 94.5.

Q. Did you have any measurements for that average?

A. Yes, sir; from the time the mill stopped until midnight. Q. Then you did have measurements for the time the mills stopped? Did you make any allowance for dinner?

A. I did not.

Q. Then will your tables here show these measurements each day in the same way, — the average results?

A. They show from midnight to midnight.

Q. From midnight to midnight by actual measurement?

A. Yes, sir.

Q. Or what actually went over the dam?

- A. Yes, sir; what actually went over the dam, excluding Hale's brook.
- Q. How much went over at Hale's brook on the 24th of August?

A. The average is not given here.

- Q. Where do you have that average, so that I can make the subtraction or addition?
- A. The subtraction is made for each measurement, thirty-six times a day. The average of Hale's brook does not appear in the records

Mr. Butler. I believe that is all, sir. I wanted merely to get at the accuracy of these calculations.

Mr. Shattuck. Are you through with the Massic, General?

Mr. Butler. Yes, sir.

BELVIDERE WOOLLEN MANUFACTURING COM-PANY NO. 2, PETITIONERS,

vs.

THE CITY OF BOSTON.

To the Honorable the Justices of the Superior Court within and for the County of Middlesex:—

Respectfully represents your petitioner, the Belvidere Woollen Manufacturing Company, a corporation under the laws of the Commonwealth of Massachusetts, doing business in Lowell, in said County and Commonwealth, that it is now, and for three years last past, and longer, has been the owner in fee-simple, and seized and possessed of certain large parcels of land in said Lowell, more particularly described in the deeds, copies of which are hereto annexed, and marked

respectively "B."

2. And your petitioner further represents, that it is now, and for the said three years last past, and longer, has been the owner, and in the possession and enjoyment of a very valuable right, privilege and easement connected with the use of said land to take water from the Concord river, in said Commonwealth, through a canal now, or formerly, of Oliver M. Whipple, of said Lowell, lying southerly of your petitioner's said land, to an amount equal to, but not exceeding, twenty-seven cubic feet per second for eleven and one-quarter hours per day for six days of the week, except when the water in said canal does not equal two hundred and eighty-eight cubic feet per second during the time aforesaid, and then and at such times to an amount equal to, but not exceeding, three thirty-seconds of the quantity of water in said canal, and the water in said canal has always equalled, and would always equal, except in very unusual and rare instances, two hundred and eight-eight cubic feet per second but for the taking, withdrawal, diversion, and obstruction of the same, hereinafter set forth.

3. And your petitioner further represents, that it now is, and for the said three years last past, and longer, has been the owner of a large mill or factory situated upon said land, and containing a large number of sets of costly machinery, each adapted to, and used for, the manufacture of flannels, which said mill or factory and sets of machinery were all erected at a great cost for the purpose of using the aforesaid right, privilege and easement to take water; and, together with said property and land, are wholly dependent for their value upon the said water, which your petitioner has the right to take, as aforesaid, by which alone said mill or factory and machinery can be used.

3a. And your petitioner for three years last past has owned, and still owns, certain other land and real estate in said Lowell, situated on said Concord river, and wholly dependent (in like manner, as hereinbefore alleged, as to the land herein first described) for its use and value on the water-rights and privileges hereinbelow set forth. And your petitioner for three years last past has owned, and still owns, the right, privilege and easement of taking eighteen twenty-fourths of the surplus water of said Concord river at the dam of the Middlesex Company, in said Lowell, over and above the amount which the Middlesex Company is entitled to take at said dam. And your petitioner for three years last past has been, and still is, lessee of the right to take three other and additional twenty-fourths of said surplus water. And your petitioner has erected and owns a certain other mill similar to that hereinbefore described, and containing similar machinery, and

other buildings, all said mill and buildings being on said land on Concord river, and all are dependent for their use and value on the abovementioned water-rights in like manner, as the mill hereinbefore described is dependent on the water-rights hereinbefore described. And the said eighteen twenty-fourths and three twenty-fourths of said surplus water in this paragraph mentioned, were, and always would be, sufficient for the use of said mill but for the taking, withdrawal,

diversion and obstruction hereinafter set forth.

4. And your petitioner further represents, that Sudbury river, so called, in said Commonwealth, is one of the natural sources and tributaries of said Concord river, and the waters thereof are the principal means of supply of said Concord river, and that the waters of said Sudbury river, when undisturbed and unobstructed, and left to their natural course and current, flow into said Concord river above said lands and mills or factories of your petitioner, and with the waters of said Concord river have been accustomed to, and of right ought to, flow through the canal aforesaid, and to pass by and through the said lands and mills or factories, and furnish the water-power on said property, lands, mills or factories and machinery are dependent for their use and value as aforesaid. And your petitioner is entitled to have its said share, viz.: twenty-seven cubic feet per second of the waters in said canal, and its share in said surplus, unabated. And your petitioner, if deprived of the right to the waters of said Sudbury river, flowing as aforesaid, would lose substantially the whole of its said rights, privileges, and easements in the waters of the said Concord river, and in said canal, and the value of its said property, lands, mills,

or factories, and machinery would be greatly reduced.

5. And your petitioner further represents, that under, by virtue of, in accordance with, and for the purposes of, an act of the Legislature of the Commonwealth of Massachusetts, passed on the eighth day of April, A. D. 1872, entitled "An act to authorize the City of Boston to obtain an additional supply of pure Water," and by and through the agency ordained by said act, the City of Boston, in the County of Suffolk, in said Commonwealth, within three years last past, previous to the filing of this petition, has taken all the water of said Sudbury river at and above the dam built by the City of Boston in 1872, five hundred feet, more or less, below the crossing of the said Sudbury river by the Boston, Clinton & Fitchburg Railroad, in the Town of Framingham, in the County of Middlesex, and near the brook which is the outlet from Farm pond into said river, and all the water in the said dam to the source or sources of said river; also all the water in Farm pond, so called, in said Town of Framingham, and all the water in the brook connecting Farm pond with Sudbury river; also all the water in all streams, brooks, and rivulets, or water-courses of any kind, whether natural or artificial, that may flow into or from said Farm pond, and into or from said Sudbury river at any point or points above said dam, subject to the restrictions set forth in section 4 of chapter 177 of the Laws of 1872 with reference to said water. To have and to hold the said waters to the said City of Boston, and its successors and assigns. to its and their sole use and behoof, agreeably to the provisions of said act of the year eighteen hundred and seventy-two. And the said city has taken the whole right, title, and interest in said waters, and has become the sole and absolute owner of the same, subject to the restrictions aforesaid. And by and as a part of the aforesaid taking, the said city has taken, and your petitioner has been deprived of substantially the whole of its said rights, privileges, and easements to take water from said Concord river, and the value of its said property, lands, mills, or factories, and machinery has been greatly reduced.

6. And your petitioner further says, that said City of Boston, by the authority and agency, and for the purposes hereinbefore set forth, and

within three years last past from the day of the date of this petition, has first actually withdrawn, diverted, and obstructed, and has ever since continued, and still continues and intends henceforth to withdrawn, divert, and obstruct the waters of said Sudbury river and said other waters in the fifth paragraph of this petition described from, and in what has always been heretofore, and what would have always been hereafter, their natural and accustomed flow into and through said Concord river, and by, through, and over the aforesaid lands and mills, or factories of your petitioner. All of which past, present, and intended withdrawals, diversions and obstructions are against the rights of your petitioner, and have deprived, and will henceforth deprive, your petitioner of the water-power to which it is entitled, as aforesaid; and have greatly diminished, and will henceforth greatly diminish, or destroy, the value of your petitioner's rights in the same, and in the said property, lands, mills, or factories, and machinery.

7. And your petitioner further represents, that by reason of said taking of the waters of said Sudbury river and the other waters afore-intended withdrawals.

7. And your petitioner further represents, that by reason of said taking of the waters of said Sudbury river and the other waters aforesaid, and by reason of said past, present, and intended withdrawals, diversions, and obstructions, and by reason of all the acts, matters, and things of said City of Boston, and its agents, hereinbefore set forth, your petitioner has suffered great damage in its property; and that it has not agreed, and has not been able to agree, with the said City of Boston upon the damages to be paid therefor; and that said city has

not offered to pay it, as such damages, any sum whatever

Wherefore your petitioner (not waiving any right to take advantage by petition for a writ of certiorari or otherwise of the great and manifold errors and irregularities in the aforesaid acts and proceedings, but expressly reserving the right so to do) prays for the assessment of the damages by it sustained, as aforesaid, and for such other relief as your petitioner may be entitled to have in this Court, and for a summons to said City of Boston conformably to the statutes in such case made and provided.

BELVIDERE WOOLLEN MANUFACTURING CO.,

By EZRA FARNSWORTH, its Treasurer.

SHATTUCK, HOLMES & MUNROE,

Attorneys, and of Counsel.

"B."

Know all men by these Presents, That I, Charles Stott, of Lowell, in the County of Middlesex and Commonwealth of Massachusetts, in consideration of seven thousand dollars to me paid by the Belvidere Woolen Manufacturing Company, a body corporate duly established by the laws of said Commonwealth, the receipt whereof is hereby acknowledged, do hereby give, grant, bargain, sell and convey unto the said Belvidere Woollen Manufacturing Company, their successors and assigns, a certain parcel of land, situate in said Lowell, and thus bounded and described, viz.: Beginning at a charred stake at the southeasterly corner of the premises, ten feet westerly of the line of Lawrence street, as the well now stands; thence north eighty-eight degrees thirty minutes west, one hundred and ninety-seven and six-tenths feet to a charred stake at a point ten feet easterly of the present line of Whipple street; thence northwesterly parallel with the easterly line of Whipple street, and ten feet distant therefrom, one hundred and eighty-seven feet to a charred stake at the southerly side of River-meadow brook; thence along the southerly side of said brook north seventy degrees forty-five minutes east, two hundred and fifty-three and seventy-five-hundredths

feet to a charred stake, ten feet westerly from the westerly side of Lawrence street, as the wall now stands; thence southerly parallel with said Lawrence street, as the wall now stands, and ten feet distant therefrom, two hundred and fifty-four feet, more or less, to the point of beginning. Also, all my right, title, and interest in and to the ten-feet strip between the easterly line of the premises and Lawrence street, as the wall now stands. Also, it is understood that the ten-feet strip between the westerly line of the premises and Whipple street shall hereafter be included in and be a part of said Whipple street. Also, that the strip of land between the southerly line of the premises and the canal shall be forever kept open and unobstructed, and the grantees, their successors and assigns, may pass upon and over the same, but so as to cause no obstruction or hindrance to the use of the same by parties having a right therein. Also, the right, privilege and easement to take water by means of the canal, now or formerly of Oliver M. Whipple, lying southerly of the premises and by means of head raceways to enter the canal at any point opposite to the premises and to conduct the water to the premises to be used thereon, and to discharge the same into said brook, and such raceways to be put in in such a manner as in no wise to injure or weaken the bank of the canal or interrupt the flow of water therein, and no right, title or interest in or to said brook is given, except to discharge the water therein. Also the right for said water to enter the canal from Concord river, to the extent hereinafter mentioned. And the right forever hereafter to have the said canal, and the banks thereof, and the permanent dam across the river, now or formerly belonging to said Whipple, continue for the purpose of affording a waterpower, and to the extent and with the exceptions and reservations herein contained and set forth. The quantity of water which may be drawn from the canal by the grantees, their successors and assigns, is strictly limited to and shall not exceed twenty-seven cubic feet per second of eleven and one-quarter hours per day of six days of the week, and if at any time the quantity of water in the canal shall not equal two hundred and eighty-eight cubic feet per second during the time aforesaid, then the grantees, their successors and assigns shall, during such time, be restricted to three thirty-seconds (3-32) of the quantity of water in the canal, meaning that the quantity of water which may be drawn from the canal by the grantees, their successors and assigns, shall never at any time exceed twenty-seven cubic feet per second for the above specified time, however great may be the supply of water from said canal, and that the quantity of water shall be restricted to such an amount less than twenty-seven cubic feet per second during the time aforesaid, as shall be equal to three thirty-seconds (3-32) of the supply afforded from the canal, when the whole water therein shall be less than two hundred and eighty-eight cubic feet per second for said time. Also the right, privilege and easement of passing and repassing with cars over the railroad leading from the Boston and Lowell and Lowell and Lawrence railroads at Whipple station to the premises, and over land now or formerly of said Whipple, as the railroad is now located, or as it may be located hereafter by said Whipple, or by the proprietors of the several rights or grants now made, or which may be made by said Whipple, or by his heirs or assigns. But this right is to be used and enjoyed in common with other grants made by the said Whipple, or which may be made, and in common with said Whipple, his heirs and assigns. Nor shall he or they be under any obligation to maintain said railroad; meaning hereby to grant the right to use the present railroad, in common with others, so long as the same may be continued; with a right, in common with others, of building a track and using and maintaining the same as aforesaid, and subject to the rights of the Boston and Lowell, and Lowell and Lawrence, and Salem and Lowell railroad companies, and subject to such changes in the

direction and location of the track as said Whipple, his heirs and asdirection and location of the track as said winppie, his helfs and assigns, may reasonably demand. Also all the rights, privileges, easements and covenants contained in a deed from Oliver M. Whipple to me, dated November 16th, A.D. 1860, and recorded in North District Middlesex Registry, Nov. 22, 1860, book 26. page 216 (subject to the reservations and conditions therein contained), and all my right, title and interest in and to the premises therein contained and described, to which deed and the record thereof reference may be had for a more full and accurate description. To have and to hold the said conveyed premises, with the privileges and appurtenances thereto belonging, to the said Belvidere Woollen Manufacturing Company, their successors and assigns, forever in fee-simple. And I, the said Charles Stott, for myself, my heirs, executors and administrators, do covenant with the said Belvidere Woollen Manufacturing Company, their successors and assigns, that the premises are free from all incumbrances made or suffered by me, except the mortgage named below, and that I will, and my heirs, executors and administrators shall, warrant and defend the same to the said Belvidere Woollen Manufacturing Company, their successors and assigns forever, against the lawful claims and demands of all persons claiming under me, except the "City Institution for Savings" at said Lowell, who hold a mortgage on said premises, dated on the sixteenth day of November, A.D. 1860, and recorded in book 26, page 220, of the North District Middlesex Registry of Deeds, which mortgage and the notes thereby secured the grantees are to assume, pay, cancel, and discharge, as part of the consideration of this deed, and save the said Stott, his heirs, executors and administrators, harmless therefrom. In witness whereof, I, the said Charles Stott, together with Sarah, wife of said Charles Stott, who hereby releases all claim to dower in the aforesaid premises, have hereunto set our hands and day of December, in the year of our Lord seals this eighteen hundred and sixty-two. Charles Stott (seal), Sarah Stott (seal). Witness: George F. Richardson to C. S., John Stott to Mrs. C. S.

MIDDLESEX, SS.

December 26, 1862.

Then personally appeared the aforesaid Charles Stott and acknowledged the foregoing instrument to be his free act and deed, before me, GEORGE F. RICHARDSON,

Justice of the Peace.

MIDDLESEX, SS., North District. Recorded Dec. 30, 1862. A. B. WRIGHT, Register.

| Stott, of Lowell, in the County of Middlesex and Commonwealth of Massachusetts, in consideration of two thousand six hundred and sixty-nine dollars and twenty-five cents, to me paid by the Belvidere Woollen Manufacturing Company, a body corporate duly established by law in said Lowell, the receipt whereof is hereby acknowledged, do hereby give, grant, bargain, sell and convey unto the said Belvidere Woollen Manufacturing Company, their successors and assigns forever, a certain piece or parcel of land situate in said Lowell, on the westerly side of Fayette street, with the buildings thereon, thus bounded, viz.: Beginning at the northeast corner of the premises, at the corner of Fayette and Pond streets; thence northerly on Fayette street to the board fence dividing the premises from the premises occupied by Erastus Stearns; thence westerly on said board fence about sixty-six feet; thence southerly along the west face of the bank wall about sixty-eight feet to said Pond street; thence easterly on said Pond street sixty-six feet, or thereabouts, to the point begun at; being the same premises to

me conveyed by Alden B. Richardson by deed dated August 6th, A.D. 1868, and recorded in Registry of Deeds at Lowell, book 63, page 277, subject to the restrictions and rights if any in said deed contained. To have and to hold the above-granted premises, with all the privileges and appurtenances to the same belonging, to the said Belvidere Woollen Manufacturing Company, their successors and assigns, to them and their use and behoof forever; and I. the said grantor, for myself and my heirs, executors and administrators, do covenant with the said grantees and their successors and assigns, that I am lawfully seized in fee-simple of the afore-granted premises, that they are free from all incumbrances, that I have good right to sell and convey the same to the said grantees and their successors and assigns forever, as aforesaid; and that I will, and my heirs, executors and administrators shall, warrant and defend the same to the said grantees and their successors and assigns forever, against the lawful claims and demands of all persons. In witness whereof, we, the said Charles Stott and Sarah Stott, wife of said Charles Stott, in token of her release of all right and title of or to both dower and homestead in the granted premises, have hereunto set our hands and seals, this thirteenth day of January, in the year of our Lord, eighteen hundred and sixty-nine. Charles Stott (seal), Sarah Stott (seal). Signed, sealed and delivered in presence of John Davis, John Stott.

COMMONWEALTH OF MASSACHUSETTS, MIDDLESEX, SS., Jan. 14, 1869.

Then personally appeared the within named Charles Stott, and acknowledged the foregoing instrument to be his free act and deed, before me.

JOHN DAVIS,

Justice of the Peace.

MIDDLESEX, ss., North District. Recorded March 27th, 1869. I. W. BEARD, Register.

LOWELL, Jan. 23, 1875.

I hereby certify the within to be true copies of the records of deeds recorded in North Middlesex Registry of Deeds.

Attest:
J. O. THOMPSON, Register.

The answer of City of Boston same as in case of Sterling Mills.

Mr. Shattuck. The Belvidere Woollen Manufacturing Company No. 2, own, first, a mill on the Wamesit dam, which was shown the other day. [Explains the boundaries.] It is admitted by General Butler that the deeds of these mills (Parker, Wilder & Company) were destroyed in the great fire; and we therefore put in an office copy. The deed which they hold is a deed from Mr. Stott to the Belvidere Woollen Manufacturing Company. There are two of them, and they are exactly alike.

This is a deed from Mr. Stott to the Belvidere Woollen Manufacturing Company, set forth in the petition; and the original office copy is annexed to the petition for shortness. It is dated December, 1862, but the day of December is left blank; and that deed seems to have been confirmed by another, which has the same description exactly, dated the

30th of January, 1869; but it is immaterial to put them both in. I suppose the other deed is valid. It is a conveyance of the land bounded and described as follows: [Reads boundaries and the deed.] This is an office copy of the deed. This is from Mr. Stott to the Belvidere Manufacturing Company. Mr. Stott is one of the members of the company. I don't know that the consideration is of any importance.

Then as to the other mill, the title is much more compli-

cated. This is called Belvidere No. 2.

In the petition it was alleged that we hold $\frac{18}{24}$ of the surplus water in Concord river, after the Middlesex has taken what it is entitled to, as we have shown. They actually owned $\frac{91}{120}$ of the water in Concord river. That is $\frac{1}{120}$ more. And I may as well give the history of this title now, in order to make it plain. In 1821, Thomas Hurd owned the land at this place, on both sides of the Concord river. On the 31st day of May, 1821, he conveved all the land on the east side of the Concord river to Winthrop Howe; and by indenture, of the same date, he made an agreement by which Mr. Howe, on the east side, became entitled to all the water-rights in Concord river at that place, subject to the right to maintain and use the water to carry three breast-wheels and a fulling-mill. The language will be given exactly. By sundry mesne conveyances and by deed of D. T. Curtis to Warren, Barry & Park, made on the 6th of September, 1831, a part of the land on the east side of Concord river was conveyed to him; and by deed dated January 2d, 1832, H. G. Howe, the grantee of Winthrop Howe, conveyed the other part of the land, bounded on the east side of the Concord river, to Warren, Barry & Park. Under these conveyances, on the second day of January, 1832, Warren, Barry & Park had all the water-rights on the east side of the Concord river, which were granted by Hurd to Winthrop Howe, — of course the rights were subject to the Middlesex right, as we call it now, or the Hurd right. Warren, Barry & Park laid out the land on a plan which is recorded in the Registry of Deeds, and referred to; and of that this is a copy. [Showing copy.] The same day that Warren, Barry & Park acquired the title, they conveyed a lot to William Eager, and conveyed to him a right to draw water through an aperture ten inches in width by 21 inches in height, which Mr. Frizell has testified would carry about 21 cubic feet water per second. I propose to put this plan in. It is copied from the Registry copy, and it was dated November, 1831, — made by Alexander Wadsworth. That was the first conveyance; and we have that under mesne conveyances, as I shall show you, — that Eager title.

Next, on the first of March, 1832, these same parties conveyed to James Stewart $\frac{1}{25}$ of the water. The only description of the water by measurement was that made for Mr. Eager. After that he described it by twenty-fifths. The third conveyance, April 1st, 1832, conveys $\frac{1}{25}$ to Abijah Brown. The fourth, May 1st, 1832, conveyed to Hale Clement $\frac{3}{25}$. The fifth, to Joseph G. Kittredge, June 12th, 1832, $\frac{2}{25}$. The sixth was to A. Smith, dated October 1st, 1832, of $\frac{6}{25}$. Now calling the Eager conveyance $\frac{1}{25}$, as it was undoubtedly intended, if you add all these conveyances together they amount to $\frac{1}{25}$.

On January 24th, 1834 (and these were all the conveyances that they made of this power), these parties conveyed to Whitwell, Seaver & Bond all the remainder of the land that they acquired from Howe & Curtis, and all the remaining water-rights, which amounted to $\frac{1}{25}$, as you will see. Whitwell, Seaver & Bond, on the 28th of April, 1835, conveyed the whole to Farnsworth, Baker & Hall. There was a flannel-mill here; and, by the way, it is not very material here now, but the rights of this flannel-mill were always described as coming first after the Middlesex.

Mr. Butler. So that all these twenty-fifths were subject

to the flannel-mill, and that had the first right.

Mr. Shattuck. Ten of our twenty-fifths are the first ones; but it is not very material, as we owned so much of it, whether we come first or after the others. Then Farnsworth, Baker & Hall, owning $\frac{1}{2}\frac{1}{5}$, conveyed May 11, 1842, to one French and others, $\frac{2}{3}$ of $\frac{1}{2}\frac{1}{4}$. Then they conveyed, November 11th, to John Holt, $\frac{1}{3}$ of $\frac{1}{2}\frac{1}{4}$. Then on December 5th, 1842, they conveyed to J. O. Peterson $\frac{1}{2}\frac{1}{5}$. So that we own now $\frac{2}{2}\frac{0}{5}$ less $\frac{1}{2}\frac{1}{4}$. That is our exact title. It is $\frac{9}{1}\frac{1}{2}\frac{1}{9}$.

I have merely stated this for the purpose of putting in the minds of the commissioners a history of the title. And now I propose to put in our deeds. We being in possession and using the water, as has been shown, I propose to put in the deeds to us which prove the title. Then I propose to put in these other deeds, for the purpose of identifying the

interest described in our title.

HENRY PARKMAN, sworn.

Q. (By Mr. Shattuck.) Have you examined the deeds of Daniel P. Curtis to Warren, Barry & Park, and of H. G. Howe to the same, and located the land?

A. I have, sir.

Q. Have you your plans that you made of it?

A. [Produces plans.]

Q. How does it compare with the land shown on these plans?
 A. These two deeds convey different parcels of land, which,

when placed together, form, as accurately as possible, allowing for two or three feet difference in measurement; they are all embraced in this plan.

Q. These deeds convey the land, i. e., the land on the easterly

side of the Concord river?

A. Yes, sir.

Mr. Butler. One of these deeds is dated the second day of January, 1832, and is from H. G. Howe and his wife to Richard Warren, Samuel Barry, and Thomas G. Park, conveying a certain parcel of land containing 103 rods, bounded as therein described, "intending to convey the same property that was conveyed to me by Winthrop Howe." . . . That conveys certain land, but no water. This other deed is a deed from Daniel T. Curtis to Warren. Barry & Park, of a certain piece of land called Belvidere, bounded as set forth in the deed, dated eighth of September, 1831. . . . "That conveys no water."

Q. (By Mr. Shattuck). Now, will you state, at the time of the deed of Warren, Barry & Park to Samuel Whitwell, dated January 24, 1834, what conveyances they had made of land and

water-rights from this lot?

Mr. Butler. I object. That must be shown from the deeds themselves.

Mr. Shattuck. I have the deeds. I produce the deeds, and

ask if he has examined any others besides those?

The Witness. I have examined the records, and find no other deeds on record. Deed James Stewart, William Eager, Abijah Brown, Hale Clement, Joseph G. Kittredge and A. Smith. These are the six. They are from Warren, Barry & Park.

Mr. Shattuck. He says there are no other conveyances from Warren, Barry & Park during that time that he has discovered.

The Witness. I would like to amend that by saying that I discovered no other deeds with relation to this land. I will not swear that Warren, Barry & Park have not made other conveyances.

Q. Here is another "Eager," and here is one "Clement," and

here is another to "Smith."

A. These in my hand, which you have just given me, are the

six deeds relating to the different parts of this land.

Mr. Shattuck. I will put those in. I will read them if you would like.

Cross-examination waived.

Q. (By Mr. Shattuck.) This is a copy of the plan referred to in these deeds? [The old map.]

A. Yes, sir. It is slightly enlarged, but the measurements are

the same.

Mr. Shattuck. At this point I would ask the permission of the commissioners to call out of the natural order of the testimony

Mr. J. Herbert Shedd, as a witness, whose engagements require him to leave the city to-day.

J. HERBERT SHEDD, sworn.

Q. (By Mr. Shattuck.) What is your occupation?

A. That of civil engineer.

Q. What branch, if any, have you been specially devoted to?

A. More particularly to hydraulic engineering.

Q. What knowledge have you of the Concord and Sudbury rivers, and what time have you spent in the investigation of them?

 Λ . I was one of a Board of State Commissioners appointed by the government to investigate that river in 1861, and was specially in charge of the observations made at that time. They extended from July until November.

Q. During that time, where were you stationed and what did

you do? State generally?

A. I had no particular station. I was in charge of all the work, and we had a large number of observers upon the stream. Mr. Storrow was a member of the commission. This extended from Saxonville to Billerica — to the Talbot and Faulkner dam at Billerica. There were, I think, 36 separate stations and observers. I was there daily most all the time.

Q. What knowledge have you of the Sudbury river, and of its flow?

A. That was included in the branch from Saxonville, and to the junction of the Sudbury and Assabet in Concord was included in this special investigation. I have special knowledge of the drainage area of the Sudbury and Assabet from other observations.

Q. How does the Sudbury compare with the Concord as a river

to furnish power, or to carry off the rainfall?

A. I think there is no great difference between the Sudbury and Concord rivers. In some respects they may be different, in one way, and that be balanced by differences in another way; so that, on the whole, I think that the supply of water for mill purposes would be about the same from the Sudbury and from the Concord.

Q. Will you state what those advantages and disadvantages

are?

A. Both rivers are what would be called slow rivers. In general, the Concord river is a slower river than the Sudbury. But the amount of water that would be gathered from the Sudbury drainage area and utilized for manufacturing purposes would be rather greater, I think, than from the Concord.

Q. Why so?

A. Because the slopes are steeper, and the water that falls upon those slopes would be less exposed to loss by evaporation than the water that falls upon the basin of the Concord.

Q. In estimating the amount furnished from the Sudbury river at the Wamesit dam, what effect would the evaporation in the Concord river have, and how would you get at the amount?

A. If I understand you, you mean whether the evaporation

from the Concord basin would be different on account of the supply from the Sudbury.

Q. Yes, sir; that is part of it.

A. I merely wish to understand the question.

Q. Yes, sir; that is the direction in which I wish to get light?

A. Well, the evaporation from the Concord basin depends, of course, largely upon the area of water surface, and then upon the area of moist meadow surface, and some evaporation, of course, from all the upland drainage area. The amount of water that would be turned in from the entire Sudbury river, I think, would make a difference in the elevation of the water surface, spreading it over a greater surface; and the evaporation would be proportionally increased; but if you should separate from that the amount delivered from the upper reaches of the Sudbury river, I think the amount of the evaporation would not be any greater

Q. The amount supplied above Farm pond would not add

on account of the amount supplied from the upper reaches.

materially to the evaporation?

A. I think not.

Q. So that if there were 288 feet running at the Wamesit dam. how would you get at the proportion of that furnished by the Sudbury river? Would you add the evaporation before getting the proportion?

A. I should in any way eliminate the subject of evaporation

from the question.

Q. Should you add the evaporation in the Concord river to the 288 feet in order to get the proportion of the water at Wamesit dam furnished by the Sudbury river?

A. Yes, sir; I should do that as a means of eliminating the ques-

tion of evaporation from the estimate of the proportion.

Q. From your knowledge of the Concord and Sudbury rivers, will you state whether or not, in your judgment, in dry weather, the Sudbury river contributes a proportion measured by the proportions of the water-shed to the supply of Wamesit dam, leaving out now the matter of evaporation?

A. Taking the whole question, as to whether the Sudbury river furnishes its fair quota and proportion from the drainage area to

the water-power at that dam, I should say that it did.

Q. Whether the fact that in measurements made at times of extreme low water, or low water during the summer season, it appeared on particular days, or for several days in succession, that there was less in that proportion in the Sudbury river, would influence your judgment particularly in this matter?

A. If it were confined to a limited time it would not influence

my judgment.

Q. Whether the aggregate of the flow of the Sudbury river during the year would not, in your judgment, more accurately measure the proportional aggregate of the flow of the Sudbury and Concord would not accurately measure the contribution through the whole season?

A. Yes, sir; I think it would.

Q. Now, will you state the reasons why you think the average

contribution of the Sudbury river is the test of its value, rather

than its contribution at the lowest points?

A. Well, I should judge that to be the case from the general character of the basins first. Also because those rivers are naturally well-reservoired rivers, and the amount that falls upon the drainage area of the Sudbury is, by reason of the natural reservoirs existing on the stream, spread over a considerable time; and it should, therefore, be taken as an average for a long time in making the estimate of the amount delivered. The fact that it is a slow river is indicated by the amount delivered from the Sudbury in time of freshet. I find that if you should plot the amount delivered in a given time, or discharged by the Sudbury in freshets, on a chart that contained that of a large number of rivers of various sizes, that would be among the slowest rivers of the entire number. That indicates that it has reservoirs possessing, either artificially or naturally, a large storage capacity.

Q. Take the water of the Sudbury when it comes into the Sud-

bury meadows.

A. You refer now to the upper portion?

Q. Yes, sir, I refer to the upper portion of the Sudbury river.

A. There are a considerable number of reservoirs, of natural ponds, and of mill-ponds. I am not sure now of the number, but I think there are about nine natural ponds and twenty-three mill-ponds, if I remember correctly, on the whole stream.

Q. Now, take the water of the Sudbury. After it gets into the Sudbury meadows, which extend to the Talbot dam, what becomes

of it when it comes in there in a freshet after a dry time?

A. It is very largely stored there. If the Concord river is running low between the banks, and has run so for a considerable time, it has drained the adjoining grounds for a long distance of standing water. It has withdrawn water from the banks, as though it were a basin of clear water free from earth. It is of very porous material, and a rise of water in the river is followed by a rise of water in this land,—very much as though it were in a large pond,—forming the water table beneath the surface of the earth. It is, of course, not so great in quantity as though it were an open pond, but it is similar, and it has a measurable value in furnishing storage for the water that comes down from the Sudbury. There is a considerable volume stored in that way by the rise of the river. There is a rise of water in the ground coincident.

Q. Do you state that from observations made by you?

A. I state that not only from general observations and reasonings in relation to this, but because I made actual test-pits during this examination, and had those test-pits with rods in them to observe the action of the river as the water rose and fell.

Q. The water table in all the surrounding lands?

A. In very many places, extending for several miles altogether.

O. Then I understand you to measure the storage basin of the

Q. Then I understand you to measure the storage basin of the Concord river not only by the river, but by the whole surrounding country?

A. The inner surrounding country.

Q. Going how far back?

A. Extending somewhat, I think, beyond what are considered by the people in that country "the meadow lands." I think it extends beyond to some extent.

Q. And that is not only a reservoir when the water is high in

the river, but when it is low?

A. Any increase of height in the stream causes in a measure an

increased height of the water table in these lands.

- Q. Now, suppose we take a rainfall of two inches in a dry time, and on the Sudbury river, when the Concord is low, is there any way of ascertaining how long a time elapses before that water gets to the Wamesit dam?
 - A. Observations, I suppose, might be made to determine.

Q. Some of it is stored in this way?

A. Yes, sir; and then it comes out from its storage. We had an observation of the stream during our experiments, which indicates very well the relative storage capacity of the Sudbury and Concord rivers. A storm occurred early in August, and there was a rainfall, I think, of a little more than three inches. (I have not referred to these reports for a long time.) The water rose in both those rivers, resulting from that storm, and continued to rise for about four days after the storm, and then, on reaching its highest point, began to fall, and continued for many days after that. The highest rise occurred in the Concord river, and the fall began earlier than in the Sudbury river. So far as that indicates the comparative value of the two rivers for storage, that would indicate that the Concord river is not so valuable as the Sudbury for storage purposes, so far as that goes. The Sudbury river was, as I remember, nearly a day later in coming to its highest stage. Then, for about eighteen days after the highest stage was reached, the effect of this storm was felt before the river was restored to its original condition - in the Concord and in the Sudbury as well. I think it was about nineteen days in the Sudbury. That is a reasonable result.

Q. You mean now at the entrance of the Sudbury into the Concord?

A. I refer now to the Sudbury — to that which reached from Wayland to Concord — a distance of a great many miles. I have forgotten just how many miles, but the whole distance from the dam is twenty-five miles to the point that I now refer to. That is a reasonable result, I think, because the Assabet river, which joins the Sudbury at Concord, and makes part of the Concord river, is a quicker stream than the Sudbury. The flow of the Concord depends not alone upon its own drainage area, but is modified by the flow from the Sudbury and Assabet; and the flow of the Concord is the result of all three. Now, the Assabet being so much quicker than either, has its weight in the Concord river, and causes that to be a quicker stream really than the Sudbury.

Q. Of course you made no measurements up at Farm pond, I suppose; but your measurements were after the Sudbury had come

down through these meadows for so many miles?

A. The upper station for measurement was at Saxonville. That

is not far from the outlet at Cochituate. But our examination extended incidentally over a considerable portion of the area.

- Q. What is the fall, if there is any, in the water of the Sudbury, between where it goes to the meadow near Saxonville and Talbot's dam?
- A. That I shall have to state from recollection; but it is possible to make it accurate, if you wish.

Q. I don't care.

A. From Farm bridge, the upper station of the main portion of the meadows, to the dam, I think, is about twenty-four or twentyfive inches on the surface of the pond; and the crest of the dam is higher than the bed of the river nearly in its entire length.

Q. What is the fall of some of the different miles in the Sud-

bury river?

A. In some of them it is very low indeed, as low as one-eighth of an inch in a mile. The falls were made largely at bars, or places where weeds had grown across, and those weeds acted to retain the water of the stream. It is very well adapted for a regulating reservoir.

Q. That is so in the lower part of the Sudbury as well as in the

Concord?

A. Yes, sir. It is so for the entire reach from Farm bridge.

Q. How many miles in the Sudbury?

A. That I should have to state in very round numbers now. But I should say it was ten or twelve miles.

Q. You remember the whole length from the Talbot dam — the entire length up to the Sudbury meadows?

A. Yes, sir.

Mr. Butler. That has already been put in and a plan.

Mr. Shattuck. I know there has been a statement made. It was stated by Mr. Talbot, but I understood him to state it in a general way.

Mr. Butler. We took it from this witness's report. The Witness. We made a survey of that district.

Cross-examination.

Q. (By Mr. Butler.) You took no measurements above the Saxonville mills?

A. No, sir; no measurements of the stream above the Saxon-ville mills.

Q. How far up the Sudbury did you go with that examination

yourself?

A. I was almost constantly, during the days of the entire season, on the river. We had a boat that was exclusively for our use. And there was the entire distance from Billerica dam to the point in Wayland — two or three miles above Farm bridge — very nearly up to Saxonville. Our station No. 1 was in the meadows above the Bridle Point bridge. I think the one you speak of is the next one below Farm bridge. Farm bridge and Saddle rock are well known; and this was in Wayland.

Q. Did you go over any portion of Sudbury river above the Saxonville mills?

A. I did for examination, but not for measurement.

Q. What examination did you make, and how many times did

you go over it above that?

- A. That I shall have to state from recollection. But to drive into it from points and make a general observation up the river, I should say two or three or perhaps four times in the season—in various points. Then I visited a number of the large ponds and reservoirs.
- Q. What did you find with regard to the large reservoir up to the head built by the city?

A. The Marlborough reservoir, I think, was on the other branch

of the stream.

Q. Was there not one on the Sudbury?

A. Yes, sir, there was one on the Sudbury; but that was not

new, and not in use at that time.

Q. And your idea would be that the mill capacity of the Sudbury river, say below Farm pond, would be very considerably increased by the fact that there were artificial reservoirs, and mill-dams that were occupied in the river above during the dry season, would it not? And therefore, that a stream which, like the Sudbury, had these large artificial reservoirs and natural reservoirs, and natural reservoirs raised in their storage capacity by artificial means, would deliver much more water to the mill-owners below there would be the natural run of the stream in the dry season, supposing there were no reservoirs there?

A. Yes, sir.

Q. About what proportion?

A. It depends entirely upon the storage capacity.

Q. But is it not a fact that a natural stream of the size of the Sudbury river, with steep banks like those you have been describing on the Sudbury river, above Saxonville mills, runs off quickest after it has been filled up after the spring rains, and in the dry

season drys up much more quickly than a larger river?

A. Every river has a law of its own. You can only speak of these rivers relatively. Now, relatively to rivers in general, I think the Sudbury river (I am now keeping in mind the part above Saxonville) — the Sudbury river above Saxonville is naturally a well reservoired river. I don't think it is so artificially. I wish to be understood as speaking of this as a naturally well reservoired river, so that it is a slow river. Now, rivers in a flat, sandy district, are very uniform in their flow. This of course is less uniform than in some other places, but it is relatively a slow river notwith-standing.

Q. Is there a single natural reservoir on the Sudbury river, above the Saxonville mills, that has not been improved by artificial

means, for storage?

A. I don't know whether Whitehall pond, which is a considerable pond, has been improved by artificial means or not. That is in Hopkinton and has a very large basin I don't know.

Q. Is not the fact that a stream is well reservoired by having its

various natural reservoirs (such as ponds) improved, and also having the low meadows improved by mill-dams, would not the value of such a stream for mill purposes below be very much improved and very much enhanced from that fact?

A. It is because it makes the flow more uniform.

Q. That is, if I understand you, when there comes a flow of water, it would flow right off from a natural stream — from a summer rain. That would be stored up and kept back by these reservoirs and these other means, and allowed to come down more slowly than it otherwise would?

A. Yes, sir.

Q. Now, sir, I desire to put to you this question: Did you ever measure the flow of the Sudbury?

A. It was measured accasionally during our experiments.

Q. How?

A. Measured by vertical floats, in the manner used ordinarily at Lowell. Of course not so accurately as there, because we could find no uniform channel. We measured with as much accuracy as we could use under the circumstances as we found them.

Q, You never measured at Saxonville?

- A. Yes, sir, we did measure at Saxonville. What the results were at Saxonville I cannot tell you; but they were measured at Saxonville.
 - Q. Were those results put into your report?

A. No, sir; they are in our notes.

Q. Where are those notes?

A. They are in our office. I have not referred to them in fifteen years. They are in our engineering office.

Q. Where is your office?

A. It is here in Court square. It is at Barristers' Hall.

Q. I wish you would go and get those?

- A. I will if I can find them. It will very likely take considerable time.
- Q. Do so in a day or two. Have you got all your measurements that you made at that time?

A. Yes, sir: all the measurements made in the experiments are

preserved.

Q. Then you also measured the flow of water at Billerica, have you not?

A. Yes, sir.

Q. Have you got those measurements?

A. Yes, sir; I suppose so. I have not seen them. I have them unless they are lost by accident. Everything was carefully preserved.

Q. So that if we can get those notes we can tell what the flow

of the Sudbury was in that year — in 1861?

A. No, sir. We can tell what it was at the time the measure-

ment was made — just at the time of the measurement. Q. And you could tell what the flow of the Concord was at the time that measurement was made?

A. Yes, sir.

Q. How long did the measurement continue at Concord?

A. I should think, for several hours, perhaps. I have not that very accurately in mind now; but the observations were made frequently, and the floats were put in repeatedly and at different lines in the stream.

Q. Did you write this report? [Showing the report made to the

House of Representatives.]

A. I wrote portions of the report. The report was put into form mainly by Mr. Alvord.

Q. But the data were got from you, I suppose?

A. Very largely.

Q. Is this correct? [Reads statement on page 21 of the report.] "Of course, any material diminution in the water reduces its level below the fordway. The four days commented upon above followed after a long-continued period of dry weather, some of it exceedingly hot. . . . There was being discharged at the dam about 100 cubic feet per second, which is probably not greater than the ordinary flow of the river." Is that a correct statement of the condition of things?

A. I should think so. You understand this refers to the twenty-four hours. I know of no reason why it not correct. That was the result of careful experiments made as carefully as gentlemen who are put upon a public work can make them under such circumstances — as carefully as was necessary under those circumstances — not so carefully as they could be made in a smooth, regu-

lar canal.

Q. Did you measure over the weir of the dam?

A. No, sir; it was measured in the channel just above the dam — what we assumed to be a fair measurement of the quantity flowing at that dam?

Q. Is this map which I now show you in this report correct?
A. It is intended to be entirely correct. It is a reduction from

the large map made from the surveys.

Q. This gives us the Concord and Sudbury rivers in 1861?

A. It gives lines of several observations that were selected from the tables for plotting.

Q. It is meant to be a profile?

A. Yes, sir — very much exaggerated.

Q. Was that map which I now show you from this report your survey? [Showing map entitled "Map giving the actual surveys, etc."]

A. Yes, sir.

- Q. Then we can rely upon the tables of this map as being accurate measurements?
- A. They were made with the greatest care, and the greatest care was taken in transcribing them. I think that report is as accurate as can be made under ordinary circumstances. The greatest care was taken in checking every result, proving the transcribing by re-reading.

Q. I desire to call your attention to this table, marked "C,"

from the report of the commissioners of 1861.

A. These columns of figures show the heights on the several days marked against them, assuming the dam to be ten. The line

marked "August 7th," or the upper line, and the line marked

"6th," do show the heights.

Mr. Butler. Now, then, we find, Messrs. Commissioners, that this is the fact, from this day-book: August 7th, water was running 1 of a foot over the dam; that is on the 7th of August. From the 7th to the 11th it was drawn down 164 inches below the dam for the purposes of experiment. From the 7th to the 30th it was kept 33 inches below the dam. Then, on the 6th of September, it was running 10 of a foot over the dam. Now, then, we have the effect of raising the dam from the 1st of September to the 11th. You started off with it 33 inches below, and the next table shows the level at 16½ inches. I think we had better put this in to have it to refer to, but not have it printed, so that we shall be at liberty to refer to any portion of the report.

Mr. Shattuck. If we can get a copy of it, I have no objection to your referring to it. With that understanding, - that you fur-

nish me one for inspection, - I make no objection.

Q. Now, I suppose what you mean to say is, that during the whole year, the areas of the drainage of a river, and the amount of water-shed as applied to rivers, will show the difference of

flow, as a rule taken during the whole year?

A. I am afraid I misunderstand your question. If I understand it, it is this: That as between two rivers, the area and the character of the surface affects the amount of water flowing through those rivers?

Q. Yes, sir.A. Yes, sir; in general terms that is true.

Q. Now, that does not constitute the whole of my question. You know the quantity of water that flows in one river, and you want to get the quantity that flows in another river. For that you would examine the water-shed to see if there was any special difference between the two, and then you would assume as an engineering fact, that if the rainfall was the same, the quantity of water which they would produce would be the same?

A. If we could discover no differences we should so assume. That, however, is not true. It is not according to the area — the

quantity of water flowing at any given time.

Q. That is what I was going to ask you — whether you would not take it through the year to get at that. Now, you didn't take

in that part of my question.

A. I think it is a fair assumption, taking the year together, that if you can discover no differences in the character of the water-shed, that the flow will be proportioned to the area, - that is, within reasonable limits?

A. Yes, sir; I say "substantially" —

Q. That is, that you would expect to approximate to it.

A. Yes, sir; and use it as a means of forming our judgment. Q. Does that hold true in the summer months, taking those alone?

A. Under the same conditions, from the same drainage area.

Q. Well, of course that cannot change very much during the year. Do not rivers separate very much in the amount of waters they afford in the summer months, while they might be substantially in relation in the winter months?

A. They do; but that is dependent largely on the character of

the drainage area.

Q. And while, taking winter and summer together, the character of the drainage area might not affect the relative proportions of water, yet when applied to the dry time, they affect it very much?

A. The difference in the drainage area that would not affect it

through the year might materially affect it in a dry time.

Q. But leaving the drainage area constant both winter and summer in a river, my question to you is, whether, whatever was the difference in character of the drainage-water, take it winter and summer, it would substantially affect the difference in the flow of water — the average flow of water during the year?

A. I am afraid I don't get your question.

Q. I will put it again. Here are two rivers, with drainage areas say of one to four. Now, under ordinary circumstances of the character of those drainage areas, not the extent, taking the whole year together, would you not expect to find the flow of water without going into the character of the drainage areas particularly, about as one to four, or approximately so?

A. I should not expect to find it so, if we exclude the charac-

ter of the drainage area.

Q. Why not?A. Because the amount collectable from one drainage area is very different from that collectable from another drainage area; i. e., the proportion of the rainfall. I suppose you assume the same depths of rain. Now the amount lost from various causes is very different in one drainage area from that in another drainage area of a very different character, throughout the year. On some of the tributaries of the Mississippi, it has been found to vary, if I remember, from 15 to 93 per cent. The percentage of rainfall collectable is found to vary often.

Q. How collectable?

A. The amount that is received into the stream, or can be measured as flowing into the stream during the whole year. That depends upon the character of the drainage area of each particular territory.

Q. Then there must be some extraordinary circumstances to

make that difference?

A. Yes, sir.

Q. I mean in the ordinary?

A. The difficulty in my mind is in limiting the word "ordinary." If the results begin to change, I cannot tell where the limit is.

Q. Is it not the fact that the difference would not be nearly as observable, taking the year through, as it would be taking the dry

months only?

A. Why, yes, sir. I think that a difference in the character of the drainage area that would not affect the yearly discharge, might materially affect the summer discharge, or the winter discharge. That is true.

Q. Yes, sir; that is supposed to be so. Now, sir, you spoke of the tributaries of the Mississippi, and that brings me to a question: Is it not a fact that the waters collectable on the area, with the drainage area the same, and the rainfall the same, is much more considerable in the dry season from large rivers than small ones, in proportion?

A. I think the discharge ordinarily from a large river is more

uniform during the dry season.

Q. I am talking about the dry season. Could you not put it a little stronger than that, Mr. Shedd? Is it not a rule in hydraulic engineering that the larger the river is, the more water is collected in the river, in proportion to its drainage area and the water-shed — more in proportion collectable in a small river?

A. Well, I think you may state that as a general rule, that the flow from a very large drainage area is a little more uniform than that from a small one. From my own knowledge I should not be

willing to put it stronger than that.

Q. Take the Merrimack, for instance, and compare it with the Spicket. Do you know that river?

A. No, sir.

Q. Compare it with the Sudbury above Saxonville, Which do you think would allow to be collected, in proportion, the most water, the Merrimack or the Sudbury, in a dry season?

A. Well, I should expect to find the flow in the Merrimack during a drought, greater in proportion to its area, than I should

the seventy miles above Farm pond.

Q. I am speaking about that. Looking at as small a stream as you know about, do you mean to say "considerably greater flow in the Merrimack during the dry season than in the Sudbury relatively"?

A. I should prefer to say "larger" rather than "considerably

greater."

Q. Would you say that it was a fair proportion at all, and will you say that you can testify with any degree of confidence from the mere fact that the drainage area, say of the Sudbury above Saxonville, was $\frac{1}{57}$ part of the drainage area of the Merrimack, — that in a dry season the Sudbury would furnish $\frac{1}{57}$ part of the water of the Merrimack?

A. On the assumption that this is the relative proportion of the area, in the absence of any knowledge, I can only state my opinion,—that I think the flow in the Sudbury would not be so

great as the proportion of the area.

Q. Now is it not a fact, Mr. Shedd, that it is very difficult, taking the dry months of the year, to ascertain what will be the flow of a river from the water-shed alone, and the rain-gauge?

A. Yes, sir, it is an uncertain problem. Q. A very uncertain problem, is it not?

A. Well, there are more uncertain problems, I think; but still

this may be classed as an uncertain problem.

Q. The question of the eternal salvation of a given man may be one, — and there is no other more uncertain problem, is there?

A. The various uncertainties of life do not occur to me particu-

larly just at this moment.

Q. Now suppose you had the measurement of the Sudbury through the dry season of one year, and the exact measurement of the Concord through the same season of the same year, — take the three dry months of July, August and September, — you could ascertain thereby, could you not, substantially what proportion the Sudbury furnished to the Concord?

A. Well, you could ascertain the amount delivered at that time.

There may be circumstances tending.

Q. I mean that you could ascertain at that time, what amount in the aggregate the Sudbury furnished to the Concord during those days?

A. If you had exact measurements of the flow of each river you

could compare them.

Q. Would not that be an exact measurement of what each one contributed to each other?

A. It might not be for another time — not for another year.

Q. I am not coming to that now. When I do, I will put it to you so that you can understand it thoroughly. I am now speaking about those three months. Would it not be the best and most accurate means of ascertaining what water the one contributed to the other during those three months — the best and most accurate means known to engineering science?

A. If fairly measured.

- Q. I am assuming that it is fairly measured. If it was honestly and fairly measured, how much would run in the Concord after the Sudbury joining, and how much would run in the Sudbury before it joined the Concord, and those were measured over weirs and through flumes in the most approved methods of modern science during the three summer months in the year, should you not say that was the best means known to science of ascertaining the amount of water contributed through the year by the Sudbury to the Concord?
- A. I would like to say, in a common way, that the actual measurement is the best means of ascertaining the amount contributed by the Sudbury to the Concord.

Q. I wanted to find out if water was a different thing from any-

thing else in that respect.

A. Actual measurement would be the best, if made at the right

place.

- Q. Now, then, would you not expect, with the same rainfall in another year, during those same three months, to find substantially the same amount of water in the two rivers.
- A. Well, I should want to know what had been done in those seasons with the dams, what mill-owners were doing with their wheels and with their ponds.

Q. Assuming that the ponds were the same.

A. Assuming that all the conditions were the same, then the

results would be expected to be the same.

Q. That is what I want to get at — all the known conditions to be the same. Suppose, then, that for a series of twenty years,

taking the rainfall on the two rivers, would you not expect to find that quantity of water maintaining relatively the same proportions as shown during the measurements during the years?

Mr. Shattuck. Do you mean the rainfall to fall on the same

days, or the same amount of rainfall?

Mr. Butler. I take the same amount of rainfall between the first day of July and the first day of October for each year.

Mr. Shattuck. Without reference to its distribution?

Mr. Butler. When I want you to put my questions I will send you notice through the newspapers.

Mr. Shattuck. I shall not wait for any such notice on your

part when I want to understand your meaning.

Q. Now I want to call your attention to this: Assuming the same amount of rainfall between the first of July and the first of October, on the same area, in the same river, the Sudbury and the Concord in a given number of years, without any known difference in the way of using the water by the dam and reservoir, would not you expect the same relative results?

A. No, sir; I should not.

Q. Why not?

- A. Because the flow of water in a stream is made up from two sources; that which falls immediately during the time that you are making the observation, and that which is supplied from general drainage throughout the territory into the river. Now if that storage basin that is beneath the surface of the earth is high in one season, the flow from the river will be great. If it is low in one season the flow from the river will be small. The rainfall may be precisely the same. All the other differences you have named will be precisely the same. There will be the difference in the flow of the stream.
- Q. Would you not expect an average result from those years? Is there any reason why, on an average, that basin below the earth should be different one year from another?

A. You have prevented our taking that into account. As I

understand it, you have limited it.

Q. Not at all. Let me go back a little. Do you assume that that storage basin which is under the earth, where water is held by the earth in a substantially constant quantity in the same river in the same year, dependent on the rainfall?

A. It is dependent upon the rainfall for a considerable anterior

period; for some time before the time that you observe.

Q. Would you not expect it in a dry season to show itself in three months in each year?

A. No, sir; I should not. I think the effect of the underground drainage is distributed over a much longer time than that.

Q. Well, suppose the amount not only in the three months should be the same, but the substantial amount of rainfall in the year should be the same, should you not expect then the storage to be substantially a constant quantity?

A. I think that is dependent somewhat upon the quality of the material. It would be the same, perhaps, in some drainage

areas, but it might not be in others.

Q. I am talking of drainage area in the same river, in the same

place, with the same rainfall upon it?

A. Yes, sir. You misunderstood me, also. I am talking of the same drainage area in the same river. What might be true in one drainage area, which was the same in these various years you are considering, might not be true in another.

Q. Compare the same drainage area in the same river, would it not remain a constant quantity with the same amount of water fall-

ing each year?

A. I think not necessarily, i. e., the time in one drainage area might extend beyond the year, when in another it would not.

Q. That may be true; but take the same drainage area?

A. I do take the same drainage area.

Q. No, no; you and I don't understand each other. I take the Concord river, and in twenty years the same rainfall in each year on its drainage area. Do you expect it to deliver the same quantity of water?

A. Yes, sir. If I understand your question now, I should expect the same drainage area with the same rainfall, distributed the same, in the same time, and in the same manner in each year for twenty years. I should expect the discharge to be the same.

Q. Would you not expect the same discharge of this basin?

A. If the rain was distributed in the same time. If it fell at different times, I should expect the discharge to be different.

Q. You would expect the whole amount to be different?

A. Not the whole amount, but the amount that flows during this dry season that we are talking about.

Q. I am trying to get at the year, but you put me off with the dry season!

A. I have no disposition to evade your question.

- Q. I want to get at what should make a difference in this storage basin in different years—the same storage basin in the same river in different years—so that it would make different results in each year. If you can tell me anything, tell me what it is.
- A. You have the same drainage area, and you have the same annual rainfall upon it. Now, of the rainfall, which we will assume to be 40 inches in each year, if 20 inches occurred before July in one year, you would have one discharge, and if 30 fell before July you would have another discharge.

Q. Precisely so. How much do you think that discharge would

be affected?

A. It is a question of fact that belongs to each case.

Q. Assume that you have 30 inches in one year between January and July, and the other year you have 20 inches, and the water has run off in the spring, as it usually does. How much difference do you suppose it would make? Would it be $\frac{2}{3}$ difference, or $\frac{1}{3}$ difference?

A. That depends upon the particular drainage area.

Q. Take the same drainage area. Take the Concord, which you know about.

A. I don't think I am sufficiently acquainted with the under-

ground territory there to give you a definite formula for a proportion. It is a question of fact that requires accurate knowledge, and I do not possess sufficiently accurate knowledge in reference

to that territory to give such a result.

Q. Now, would you not value more as a result, in reference to the ascertaining of the relative amount of water which one stream affords another, to have in a dry time an accurate measurement of both streams, and to know just what one puts into the other, and then reason from that as to how it would be the next year, and the next, and for the average number of years, than you would any

other means of getting at it?

A. No, sir. It would be a valuable indication to have an accurate measurement of the sort you describe. But, if that indication was different from what you had derived by general acquaintance with the subject and with the territory; if that result was contrary to what you would expect from the knowledge that had been obtained from numerous other cases—I should say there was some peculiarity in that measurement, and that, therefore, it was not worthy of great confidence, and that it should extend over a greater time in order to furnish a fair basis for estimate.

Q. The only peculiarity you would find would be the shortness

of it?

A. Largely the shortness of it.

Q. Suppose you had it for three years?

A. That would increase its value.

Q. Suppose we had the exact measurement of the Sudbury, and the exact measurement of the Concord, if it were possible, for a period of three years, what would you say as to that as being more valuable?

A. The value of that observation would be very much increased

over that for one year.

Q. Don't you think that under such circumstances that would be the most accurate means of determining the amount of water

the Sudbury gave to the Concord in the dry season?

A. That is a question of comparison. I don't think I can say now which I should regard as the most important. That is certainly valuable information, and would be entitled to a great deal of credit.

Q. And more so if you were confident that the measurements

were accurately made?

A. Certainly; I should rely upon its being accurately made to entitle it to any confidence at all. But still if there was a conflict between that and general information upon the subject, I should wish to make a careful consideration of the whole matter before I relied upon it for any important enterprise.

Q. Now, then, assume this, Mr. Shedd, that the measurement of the Sudbury had shown in such a ratio to the rainfall for three years on the territory. Would not you expect that that would be

substantially constant in the Sudbury?

A. Well, no, I think not.

Q. Why not?

A. Well, the Cochituate basin is a part of the Sudbury basin.

The measurements that have been made there show that the percentage of water collectable in that basin has varied from 60 per cent. of the rainfall, as I remember it, down to 25 per cent. In one year there has been only 25 per cent. of that rainfall collectable into the Cochituate. Now you might select three continuous years that would be very unreliable, and would not be a fair average.

Q. Is there any continuous three years of that sort?

A. I have not made an examination that I remember, so that I can answer that question; but I presume that there may be three continuous years selected. That would not be a fair average for a long period.

Q. Then you must infer that there is something very curious

about the water-shed of the Cochituate?

A. No, sir; I think that the water-shed of the Cochituate has only the same degree of curiousness that many water-sheds have. They are all curious.

Q. That is, they are so different from one another, that it is very difficult predicting upon them what they will do in the way of

collecting water, I suppose?

A. Well, there are variations, of course; and when you wish to engage upon an investigation of how much it would yield, all the considerations must be taken into account; and when you have made up a judgment, it is only an approximate one, but it may be a reasonably approximate one.

Q. Finding that the Cochituate varies with the rainfall, — varies from 25 to 60 per cent., — and finding that as a part of the Sudbury rainfall, you might well conclude that the Sudbury would do the

same, might you not?

A. Other portions of the Sudbury might not be of the same character as the 19 miles that are drained into the Cochituate. It

would depend somewhat on the character of the territory.

Q. But if you should find this: that there had been a substantially uniform percentage of water yielded to the Sudbury river from the rainfall each year, — you would assume, without knowing any other thing about it, that that would continue for the average of years?

A. The longer you continued these experiments, the more

valuable it would be as a general indication.

Q. But you would assume that three years would give a valua-

ble average?

A. That would, as I say, be a valuable indication of what the average would be.

Re-direct.

Q. (By Mr. Shattuck.) Do you know any other reason for a higher minimum in a large stream than in a small one, than that its contributions come from a larger area, and therefore furnish a higher average?

A. No, sir; no more than that on the larger area you have the various different characteristics of drainage area blended together;

so that where you would have a loss in one you would make it up by a gain in another, so that the average would be more

uniform.

Mr. Shattuck. You stated to the commissioners, Mr. Butler, that these two deeds that you examined didn't contain any water privileges. But on looking them through you will see that they do contain water privileges and mill privileges.

JOHN STOTT, sworn.

Q. (By Mr. Shattuck.) I should like to ask you with reference to the use of steam in your mill — the Belvidere No. 1. What do you manufacture there?

A. Blankets.

Q. You have an engine there?

A. Yes, sir.

Q. Whether you use that exhaust steam from the engine for dyeing?

A. Yes, sir.

Q. Whether you have ever attempted to use the exhaust steam

for dyeing purposes?

A. When we put in this new so-called Harris-Corliss steam engine, the builder made us believe we could use the exhaust steam for dyeing purposes, and we put in an arrangement which he provided for that purpose; but we didn't use it more than one day before we pronounced it a failure.

Q. Why? Would it not work?

A. Because the greater portion of our goods we dye scarlet, and we have found that the condensed steam — the extra length of time the cloth is to be in the vat to dye scarlet before it was dyed — the condensed steam would so condense the cochineal and dyestuff, as to materially alter the state of the scarlet.

Q. So where you dye scarlet you cannot use the steam from the

exhaust, but must have it from the boiler?

A. Yes, sir; that is our experience. I don't mean to say that the exhaust might not be used for wood colors, but not for cochineals, for that requires a greater heat, and exhaust steam does not produce the greater heat that is produced for scarlet; and so in scouring wool the exhaust steam is not hot enough, and it puts so much condensed steam into the kettle for boiling wools, that it materially reduces the strength of the liquids.

Q. How as to using it in your mill for heating purposes? Have

you used it for that?

A. We came to the conclusion that it would require as much more pressure on the boiler to work the back-pressure occasioned by using the exhaust steam in the mill for heating purposes, that we should not be any the gainer by it in a mill of that size and that construction for heating purposes, i. e., the steam-pipes being all so small that we considered that it requires from twenty-five to thirty pounds pressure on the boiler at any rate to get the steam through, and we should have to get so much more pressure on the

boiler to work the back-pressure, if we had any exhaust steam to use.

Q. You find, then, that with a mill of your size, and applied to your business, you could not use exhaust steam for dyeing the wool, washing or heating?

A. That is our experience, and we don't use it.

Q. How much have you used of your auxiliary power during the last three months generally — during the time since the taking

of the water by the city?

A. Well, unless it has been after a rainfall — a rainfall affects the Concord river, so that it would last perhaps, according to the rainfall, three or four days. Perhaps we might not use the engine at all for that period, and then when it falls away, we shall have to be prepared to use the engine, and have to use it an hour or two in the morning and an hour or two in the forenoon, or the greater part of the afternoon.

Q. That has been so for the last three months?

A. Yes, sir.

Q. I should like to ask you as to Belvidere No. 1. In the pur-

chase in 1832 they purchased land and water?

A. Yes, sir; it was conveyed to Mr. Stott. It was bought ostensibly for the Belvidere Company. It was bought by him and conveyed to the company. That was the intention at the time. The Belvidere Company took possession of it. It was bought by Charles Stott with the intention of conveying to the Belvidere Company.

Cross-examination.

Q. (By Mr. Butler.) Your uncle, Charles Stott, bought the

site and built the mill, didn't he?

A. No, sir. If my recollection serves me right, the conveyance was made before the mill was built — the land and the water privilege.

Q, Do you know what he paid for the land and water privi-

lege?

Mr. Shattuck. I object to that.

Mr. Butler. I insist upon the question.

A. I could not say.

Mr. Shattuck. It is too remote to be of any value.

Q. What did it cost to build the mill?

A. I could not tell you that without referring to my books.

Q. You can tell by referring to the books, can't you?

A. I can give you an approximation. There are one or two contracts that are specified; but I don't think we could get at the exact cost of everything.

Q. Within how near can you get at it?

A. You mean of the mill No. 2 alone, without the land and machinery and water privilege?

Q. Yes, sir; I think you could get at that pretty near what it cost. I guess you remember near enough for my purpose.

A. I would not undertake to say, General.

Q. I wish you would let me know, if you have the means. Did it cost over eleven thousand dollars to build it?

A. Yes, sir.

Q. How much more?

A. I will not undertake to give the figures. I don't propose to give the figures, because I have not charged my mind with them, and it is a good many years ago, and I should have to refer to my

books to give anything like the exact figures.

- Q. Give me the exact figures of the cost of the mill alone, and bring them down when we meet here again. Now, how many days in the year do you run your engine, or did you when you put it in, before the water was taken, during the last five years, in No. 1 mill?
- A. It was put in there on account of short water, although it has never been run.

Mr. Shattuck. He has answered that once.

A. For how long a period do you mean — for one year back?

- Q. No, no! Before the water was taken,—say before 1872, how much on an average did you run your engine for No. 1 mill before 1872,—before the water was taken at all by the city? The first water taken was in 1872. Now will you answer the question?
- A. That is back four years from this. Well, I should say, without being obliged to give exact figures, as near as my recollection serves,-I know there was a period along there of several years, for five or six years back, that the water had been so abundant that it excited remark from those interested there.
 - Q. Just give me the reason for it. How much time was it?

A. Perhaps a month during the year.

Q. When did you put in the new Corliss engine?

A. In 1871 or '72. It was when Mr. Stott was gone to England, I know. I forget whether it was 1871 or '72.

Q. The old gentleman is well, I trust? A. Yes, sir; for an old gentleman.

Q. Bright and smart?

A. Yes, sir.

Q. He built all the mills, and knows all about it, does he not?

A. Yes, sir; I presume so.

Q. And is a practical manufacturer, and uses steam, and knows a good deal more about it than you do?

A. I presume he does.

Q. Do you know any reason why they don't call him down here to testify?

A. No, sir, I do not. It was because they did not want him, I

guess.

Q. That is the very reason, I guess; you and I hit it exactly alike. And do you take your steam for heating out of one of the boilers that runs the engine?

A. Yes, sir.

Q. Under what pressure do you use your steam for heating purposes when the engine is not on, and when you are not likely to use the engine?

A. Thirty or forty pounds of steam, or forty-five pounds. It may vary ten or fifteen pounds during the day. It may run up to fifty pounds, probably, at some periods of the day. It depends upon the weather also. In cold weather we run up to sixty pounds.

Q. Under what pressure do you run your engine?

A. Seventy or eighty pounds.

Q. Is the amount of that pressure necessary to force the heat through your steam-pipes?

A. Not to force the heat through the steam-pipes. Any man

would know that.

Q. To force your steam through and get the requisite quantity of heat?

A. No, sir; it does not require seventy pounds pressure to force

steam through the pipes for regular heating purposes.

Q. I asked you what pressure you run when using steam for heating?

A. I say when the engine is not on it varies from thirty-five to

fifty pounds.

Q. Undoubtedly; and do you use it in that way because it is

necessary to use it so?

A. Well, you have to have steam for dyeing purposes. It is all used from one place. The steam is drawn for dyeing purposes and heating purposes and for dressing purposes.

Q. I am coming to that. You don't first take your steam through the heating apparatus for dyeing purposes, but take it

directly from the boiler?

A. Yes, sir.

Q. Suppose you are not dyeing, but only heating, does it make any difference?

A. Yes, sir: there would be some difference. We should not

keep so high a pressure of steam on.

Q. Then you require that high pressure for dyeing? Is that so?
A. I said we should not keep so high a pressure if we were not using the steam for dyeing purposes.

Q. And the high pressure you do use is for the purpose of

dveing?

- Λ . We put it up to a higher pressure than we should if we were not dyeing with the steam. You can draw your own inference from that.
- Q. You and I understand each other perfectly upon that. Very well, now, your scarlet dye, I suppose, is made with a liquid in water?

A. Yes, sir.

Q. And you cannot heat that water with the exhaust steam hot enough you say?

A. That is what I have said.

Q. How many degrees, about, do you have to get the dye up to?

A. Well, we leave that entirely with the dyer.

Q. I understand that you do; but how many degrees of heat does he want?

A. Well, I cannot say — not to be exact about it.

Q. State nearly.

A. Somewhere in the neighborhood of 200 degrees Fahrenheit. I should say that it may be more or less than that. I would not say positively.

Q. And you say the exhaust steam will not heat up to that?

A. I said that was our experience on that. I said we had tried it, and I remember it.

Q. Now another thing. Your scarlet dye is the same as that used in bunting. Is the scarlet that is required for flannel and

what they require for bunting the same?

- A. I have nothing to do with their requisites for bunting. It may require a stronger heat for bunting than for flannel. I presume it does.
- Mr. Shattuck. Is the dye the same for bunting as for flannel? Mr. Butler. They are both made of wool the bunting of a little coarser wool than the flannel.

Q. The Corliss people recommended you to use the exhaust

steam, didn't they?

A. Mr. Harris did. It is a Corliss engine built by Mr. Harris.

Q. And you did use the exhaust steam for dyeing for a while, or attempted to use it, but you could not use it for heating at all. Well, was not your trouble that you had very little occasion to run your engine, — so that you would have your exhaust steam for only a very few days in the year, while you wanted the heat for nine months in the year?

A. The exhaust steam was not to be depended upon to heat the mill with. There would be some days when we would not use the

engine at all, and we would still want to heat the mill.

Q. That is why I asked you how you run it. You would heat the mill nine months in the year.

Re-direct.

Q. (By Mr. Shattuck.) What is about the value of the No. 1 Belvidere property—the whole of it there—dependent on the water-power?

Mr. Butler. I object. I don't think he has the requisite knowledge to testify about that. I will not object to the old gentleman's testifying if he is called.

Q. How old is the old gentleman?

A. Seventy-six.

Q. On these matters which you have testified about, you understand that his views are not different from yours in any way?

A. I don't know how they can be.

- Q. He is very likely to talk a good deal, and if examined by Gen. Butler would start off and talk?
- A. I mean to say that I don't know why he and I would be inclined to think differently with regard to Belvidere. I don't know what his thoughts are, I am sure.
 - Q. (By Mr. Butler.) The difference is that he built it, and

you didn't?

A. No, sir; there are other parties concerned with building it

whom you do not get hold of.

Q. (By Mr. Shattuck.) I press the question. I think that upon the whole this witness knows as much about the rules of it as any one?

Mr. Butler. I don't think he is competent to testify about it

at all.

Q. How long have you been there?

A. Fifteen years.

Q. You know about the business done in the mill, do you?

A. Yes, sir.

Q. You understand in regard to the financial exhibits? So far as they are concerned, you know as much as any one, don't you?

A. The General thinks I do not.

Q. I didn't ask the General's opinion, but yours?

A. I should not presume to say that I know as much as any one else.

Q. You were brought up in the mill?

A. Yes, sir.
Q. You take charge of this whenever it is necessary?
A. Yes, sir.
Q. You have watched the building of mills?

A. Yes, sir.
Q. You have been there over twenty years? A. About twenty-four years, on and off.

Q. I suppose mills have hardly ever been bought and sold there, have they?

A. Not much, under my knowledge. Mills do not very often

change hands there.

Q. This is owned by a corporation, I understand, and not by an individual. Can you tell us about the fair value of that first Belvidere property?

Mr. Butler. This is not in answer to any part of my cross-

examination.

Q. Will you state the value?

- A. In that question I understand you to mean the value of the property dependent upon this mill machinery and privilege. There is other property in the same yard which is Belvidere property. All the adjacent property owned by the company that depends upon this mill, or is rather the outgrowth of this mill, is what you mean. Oh, it would be somewhere in the vicinity of \$100,000 take it all.
- Q. Now take Belvidere No. 2, and all the property and machinery connected with it. What is the value of that?

Mr. Butler. I will object to that.

Mr. Shattuck. I thought you wanted to know about it a minute

Mr. Butler. I persist in objecting that you persist in putting

in evidence when I want to go away.

Mr. Shattuck. I have nothing more to ask. I will put in the deeds.

Re-cross.

Q. (By Mr. Butler.) What is the property taxed for?

Mr. Shattuck. I object.

Commissioner Russell. As a substantive fact the tax value is not admissible; but I cannot say that General Butler should not ask that question on cross-examination.

Mr. Shattuck. Can he ask this witness in cross-examination

what another man thinks of his property?

Commissioner Russell. The witness having given an opinion as to the value of a piece of property, we think it is within the limits of cross-examination for the counsel to ask him what the tax value is.

Mr. Shattuck. I appeal to the chairman to say whether that was ever known in the trial of these land cases, to allow either directly or indirectly the tax value of property to be got in. I never knew it to be got in in cross-examination or otherwise. I am speaking of practice within my own knowledge, and that of the chairman, whether it is not one of those things, within the discretion of the court undoubtedly, but which will have such a tendency to influence the minds of the jury by getting in incompetent evidence, that counsel are never allowed to ask them?

Commissioner Russell. It would not have the slightest influence upon my mind in showing the real value of the property; but the answer might have some influence to show the capacity of the

witness.

Q. What is it taxed for?

A. I don't know.

- Mr. Shattuck. That is, it is not taxed by Lowell, but by the State of Massachusetts. Now I will proceed to prove this title, if I can.
- Q. (By Mr. Shattuck.) They were in possession of these mills I mean the Belvidere No. 1 Company and have been for some time?
- A. Mr. Stott has been owner there somewhere in the vicinity, for forty years.

Q. How far back have you known their relationship to it?

A. This so-called company was chartered in 1853. They were in possession of this property at that time — not all of the property. What I testified to in relation to the \$100,000 was not all in at that time.

Mr. Shattuck. I first put in the deed of Walter Farnsworth to Charles Stott and the Belvidere Company, bearing date the 15th day of November, 1853; the original has been burned, but this is good enough. It is twenty years old. Mill No.1. This contains a description of some lots of land, which are immaterial, because they do not earry any water; and they are a little back, and I don't care to read them. The first description is of a certain other lot of land, situated in said Lowell, on the east side of Concord river, with a stone building thereon. [Reads description.] Now,

I propose before describing the other parts of the deed, to put in the deed of Warren and Alpheus Smith.

Mr. Butler. Pardon me, I think we had better have one deed

at a time.

Mr. Shattuck. [Reads rest of the deed.] The Eager lot is the one where the measurement was—the first one sold to Warren, Barry & Park. Then we have beside that all the real estate comprehended in the fourth clause of the descriptive part of the deed of Farnsworth to Stott, "subject to all the restrictions in said deed contained, with all buildings now standing on said real estate, and all property covered by said descriptive deed," etc., etc. Those three, therefore, contain $\frac{1}{27}$ less $\frac{1}{24}$ —

Mr. Butler. I object to this continual statement of the case. Commissioner Russell. I understand Mr. Shattuck to mean that by this description he proposes to show that such property is intended to be included by [such description] the reference in

the deed.

Mr. Shattuck. I have read all the parts that are material bearing upon this water-power. If the gentleman wants to read

other parts he can do so. The deed will be printed.

Mr. Butler. In consideration of \$10,000 to them paid by the Belvidere Company, not only all the water-power that they have, but all the buildings and a large quantity of other land is con-

veyed. If the deed is printed I am content.

Mr. Shattuck. It was conveyed to a corporation, in which Mr. Stott took stock. In the next place, I put in the deed of Joseph Church, Leonard Church, and George Ripley to the Belvidere Company, bearing date September 22d, 1864. It conveys lots 2, 3, 4 and 5, and part of lot 6, on this land, which I now indicate on this plan. [Reads the descriptive part of the deed, and explains the location from the plan.] Now, to show what the water connection with that is, I refer to the same land as described in the deed from Warren, Barry & Park to Clement. The works are also described. The same description of the land is given, and with it is conveyed $\frac{3}{25}$ part of the water in Concord river. We put in a deed of a certain mill, and its privileges and appurtenances. Then we find the same land previously conveyed by a deed, recorded, in which the same property is described; and the appurtenances, so far as the water is concerned, is described as $\frac{3}{2.5}$, and that, in the absence of evidence to the contrary, is evidence tending to show the appurtenances.

Mr. Butler. For the purpose of showing what is conveyed in another deed, to show that another person conveyed to somebody else a certain thing! I never heard of that being put in in such a

case before.

Mr. Shattuck. This deed is in our chain of title.

Mr. Butler. Whenever the chain is made, I don't care to ob-

ject to it.

Mr. Shattuck. We have put in now a warranty deed, and we also prove possession under it, and that makes out a title, prima facie. Now those deeds, — some of them directly and some indirectly, — refer to other deeds for the identification of the land. And I pro-

pose to put in some deeds here, which are in the chain of title, and in which that land is described, for the sole purpose of identifying the land, and also for the purpose of defining that conveyance, without putting in the whole chain of title.

Mr. Butler. I have no further interest in this title, if this can

be done.

Commissioner Russell. Why not put in the whole chain of title?

Mr. Shattuck. There is no difficulty except in the quantity of

deeds. We have a list of all the deeds here.

Mr. Butler. The difficulty is that nobody knows where this title is. We have got to pay somebody, and after we have paid you, under the presumption that you own $\frac{9}{120}$. Then the Nesmith heirs and Mr. Holt and another gentleman will come in here and prove just as clear as light that they own about $\frac{6}{25}$; and then the Middlesex will come in and insist that they own $\frac{9}{25}$. Well, we don't want to pay it more than once. Therefore I want you to prove your title. I prefer to have you make up your case, rather than to have to make it up myself.

Commissioner Russell. The difficulty is, Mr. Shattuck, that ordinarily proof of a conveyance, and of possession under it, is prima facie proof of title, and that when you undertake to show a conveyance which does not specify the amount of water, or the proportionate amount of water, that goes with the land, your proof of possession does not tend to show the possession of any specific or any proportionate quantity of water, and therefore

does not make out your title to your water-rights — although it may make out your title to your land.

Mr. Butler. And we have not touched your land. Therefore I admitted the land and denied the water. I knew you owned the land, and I did not want to interfere; but I did not know that you owned the water, and I wanted you to prove it.

Mr. Shattuck. Then we will go on and prove the title.

The first deed is Farnsworth to Stott and the Belvidere, marked "1;" the second is Church and others to the Belvidere, marked "2." Now, I put in the deed marked "3," referred to in the first description, being the same lot of land conveyed by Richard Warren and others to Alpheus Smith—the deed dated October 1st, 1832. Now, I will put that deed in. In the description there is a reference to this deed. [Reads the descriptive part and explains from the plan.]

Now, for convenience, I may as well put in the deed marked "4," of Thomas Heard, of Chelmsford, to Winthrop Howe, bearing date the first day of May, 1821. [Reads the descriptive part

of the deed.

Know all men by these Presents, That I, Thomas Hurd, of Chelmsford, in the County of Middlesex and Commonwealth of Massachusetts, gentleman, in consideration of two thousand five hundred dollars, paid by Winthrop How, of the same Chelmsford, clothier, the receipt whereof I do hereby acknowledge, do hereby give, grant, sell and convey unto the said Winthrop How, his heirs

and assigns, a certain tract of land, with the buildings thereon, situate in Tewksbury, in said county, near the mouth of Concord river, containing ten acres (be the same more or less), bounded, beginning at the northeast corner at said Concord river, by the land of Edward St. Loe Livermore, Esq.; thence running south 5° east twenty-nine rods of the land of said Livermore twentynine rods to the road leading to Tewksbury; thence crossing said road to the end of the fence; thence south 7° east five rods; thence south $1\frac{1}{3}$ ° west thirteen rods; thence south $16\frac{3}{4}$ ° west nine rods and five-tenths; thence south 66° west five rods and eight-tenths; thence south 29° east five rods and two-tenths, to said Concord river; thence down said river to the bounds first mentioned, with the privileges thereunto belonging, excepting the mill privilege where the old saw-mill now stands, the said Hurd reserving to himself, his heirs and assigns a right to erect and maintain a dam across said river, above said saw-mill, where the dam now stands; and also a right to draw and use the whole of the water of said river above said dam, at his the said Hurd's factory, on the west side of said river. To have and to hold the aforegranted premises to the said Winthrop How, his heirs and assigns, to his and their use and behoof forever. And I do covenant with the said Winthrop How, his heirs and assigns, that I am lawfully seized in fee of the afore-granted premises, that they are free from all incumbrances, that I have good right to sell and convey the same to the said Winthrop How. And that I will warrant and demand the same premises to the said Winthrop How, his heirs and assigns forever, against the lawful claims and demands of all persons.

In witness whereof, I, the said Thomas Hurd, have hereunto set my hand and seal, this thirty-first day of May, in the year of our Lord one thousand eight hundred and twenty-one. Thomas Hurd

and seal.

Signed, sealed and delivered in presence of us, Nathaniel Wright, Levi Felton.

Middlesex, ss. June, 19, 1821.

Then the above-named Thomas Hurd acknowledged the above instrument to be his free act and deed. Before me,

NATHANIEL WRIGHT,

Justice of the Peace.

MIDDLESEX, ss., Oct. 15, 1822. Received and recorded by WM. F. STONE, Reg.

A true copy of record, book 243, page 324.

Attest: CHAS. B. STEVENS, Reg.

This was a conveyance of property on the east side, Heard reserving to himself the right to erect and maintain a dam across the river above the old saw-mill. That seems to give him all the water of the river, and the right to build a saw-mill. That I will put in.

Here is an indenture of the same date as the last, between Thomas Heard and Winthrop Howe, dated the 31st day of May, 1821. That is marked "5."

This indenture, made this thirty-first day of May, in the year of our Lord one thousand eight hundred and twenty-one, between Thomas Hurd of Chelmsford, in the County of Middlesex and Commonwealth of Massachusetts, gentleman, of the one part, and Winthrop How of the same Chelmsford, clothier, of the other part, witnesseth that the said Thomas Hurd, in consideration of the sum of one thousand dollars to him paid by the said Winthrop, the receipt whereof the said Thomas Hurd doth hereby acknowledge, hath given, granted, bargained, and sold, and by these presents doth give, grant, sell, and convey unto the said Winthrop How, his heirs and assigns, forever a right to build any mill or mills on the east side of Concord river below the milldam running from said Hurd factory on the west side of said river to the easterly side thereof; also a privilege to draw and use the water from the mill-pond above said dam for the purpose of carrying said mill or mills, the said Hurd reserving to himself, his heirs and assigns, the first and exclusive right to the use of sufficient water from said pond to carry a fulling-mill and three bust-wheels, each twelve feet in diameter and fifteen feet in length, with the machinery and works that may be attached to or connected with the same. To have and to hold the aforegranted premises to him, the said Winthrop How, his heirs and assigns. And the said Thomas Hurd does, for himself, his heirs and assigns, covenant and agree with the said Winthrop How, his heirs and assigns, that he will always hereafter maintain and keep in good repair the aforesaid milldam at his, the said Hurd's, own expense, and at his own expense erect a flume ten feet in length and eight feet wide, near the east end of said milldam, and keep the same in repair. And the said Winthrop How does for himself, his heirs and assigns, covenant and agree with the said Thomas Hurd, his heirs and assigns, that he or they will not draw or use any of the water from the aforesaid mill-pond when there is not sufficient head of water in said pond to carry a fulling-mill and three bust-wheels as aforesaid, or in any way deprive the said Hurd of the first and exclusive right to the use of the water in said mill-pond as hereinbefore reserved.

In witness whereof the said partis have hereunto set their hands and seals the day and year above written. Thomas Hurd, and seal,

Winthrop How, and seal.

Signed, sealed, and delivered in presence of us: Wright, Levi Felton.

MIDDLESEX, SS.

June 19, 1821.

Then the above-named Thomas Hurd acknowledged the above instrument to be his free act and deed. Before me,

NATHANIEL WRIGHT, Justice of the Peace. MIDDLESEX, SS.

Oct. 15, 1822.

Received and recorded by

WM. F. STONE, Reg.

A true copy of record, book 243, page 325. Attest: CHAS. B. STEVENS, Reg.

Mr. Butler. The reservation of the saw-mill still stands, with the privilege thereof.

Mr. Shattuck. That is a question of law, which we can dis-

cuss at any time.

Commissioner Russell. You claim that the title to the water is

in you, under this indenture?

Mr. Shattuck. Yes, sir; I have no doubt about it in my own mind. Then I put in a deed marked "6," from W. Howe and H. G. Howe:—

Know all men by these presents, That I, Winthrop How, of Tewksbury, in the County of Middlesex and Commonwealth of Massachusetts, yeoman, in consideration of four thousand dollars paid me by Harrison G. How, of the same Tewksbury, manufacturer, the receipt whereof I do hereby acknowledge, do hereby. give, grant, sell, and convey unto the said Harrison G. How a certain piece or parcel of land, with the buildings thereon situate, in said Tewksbury, containing one acre and one hundred and three rods, bounded as follows, viz.: beginning at the southeasterly corner thereof at a stake and stones at Concord river, thence running north forty-seven degrees west four rods and nineteen links to a stake and stones; thence north thirteen degrees west four rods and twenty-two links on land of Daniel T. Curtis, to a stake and stones; thence north eleven degrees west seven rods and five links on the said Curtis' land to a stake and stones; thence north three degrees west six rods and twenty links on land of Windsor How, to a stake and stones; thence north eighty-six and one-half degrees west eight rods and one link on said Winthrop How's other land to a stake and stones; thence south twelve and onehalf degrees west twenty-three rods and five links on said Winthrop's other land to the mill-dam; thence easterly to the bound first mentioned, together with the mill privilege and all other privileges and appurtenances to the same belonging. To have and to hold the afore-granted premises to the said Harrison G. How, his heirs and assigns, to his and their use and behoof forever; and I do covenant with the said Harrison G. How, his heirs and assigns, that I am lawfully seized in fee of the afore-granted premises, that they are free of all incumbrances, that I have good right to sell and convey the same to the said Harrison G. Howe; and that I will warrant and defend the same premises to the said Harrison G. How, his heirs and assigns, forever, against the lawful claims and demands of all persons.

In witness whereof, I, the said Winthrop How, and Lydia, the

wife of the said Winthrop, who hereby releases all right to dower in said premises, have hereunto set our hands and seals this twenty-third day of October, in the year of our Lord, one thousand eight hundred and twenty-eight. Winthrop How, and seal, Lydia Howe, and seal.

Signed, sealed and delivered in the presence of us: Nathaniel Wright, Luther Marshall, Christopher Flanders, Freeman Howe.

MIDDLESEX, SS.

October 23d, 1828.

Then the above-named Winthrop How acknowledged the above instrument to be his free act and deed before me.

NATHANIEL WRIGHT, Justice of Peace.

MIDDLESEX, ss., Dec. 5, 1828. Received and recorded by WM. F. STONE, Reg.

A true copy of record, book 285, page 62.
Attest: CHAS. B. STEVENS, Reg.

Mr. Butler. I should like to have the descriptive parts of these deeds printed.

Mr. Shattuck. In each deed let such portions as either counsel desires to have printed, be marked.

Here is the Curtis deed. [Reads description.]

If we are obliged to locate these deeds, I shall have to ask Mr. Parkman to give me his plan, so that I can locate them again.

Commissioner Russell. Can't you get the deeds for this whole

chain of title before the next meeting?

Mr. Shattuck. We have references to all the deeds — showing the whole chain of title. If Gen. Butler prefers to have them, we can produce them.

[Adjourned to Wednesday, Oct. 25, at $9\frac{1}{2}$ o'clock, A. M.]

CONTINUATION OF TITLE OF BELVIDERE MILLS.

Know all men by these Presents, That I, Harrison G. Howe, of Tewksbury, in the County of Middlesex and Commonwealth of Massachusetts, manufacturer, in consideration of twenty thousand dollars to me paid by Richard Warren, Samuel F. Barry and Thomas B. Park, all of Boston, in the County of Suffolk and Commonwealth aforesaid, merchants, the receipt whereof is hereby acknowledged, do hereby give, grant, bargain, sell and convey unto the said Richard Warren, Samuel F. Barry and Thomas B. Park and their heirs and assigns forever, a certain piece or parcel of land with the buildings thereon, situated in said Tewksbury, containing one acre and one hundred and three rods, bounded as follows, viz.: Beginning at the southeasterly corner thereof at a stake and stones at Concord river; thence running N. 47° W. four rods and nineteen links to a stake and stones; thence N. 13° W. four rods and twenty-two links on land of Daniel T. Curtis, now or formerly to a stake and stones; thence N. 11° W. seven rods and five links on land now or formerly of said Curtis to a stake and stones; thence N. 3° W. six rods and twenty links on land now or formerly of Windsor Howe, to a stake and stones; thence N. 863° W. eight rods and one link on the land now or late of Mr. Winthrop Howe, to a stake and stones; thence S. 123° W. twenty-three rods and five links on land now or formerly of said Winthrop Howe to the milldam; thence easterly to the bound first mentioned, together with the mill privilege and all other rights, easements, privileges and appurtenances to the same belonging; intending hereby to convey the same property which was conveyed to me by Winthrop Howe by his deed recorded with Middlesex Deeds, book 285, page 63. The premises are subject to a mortgage given to secure the payment of three thousand dollars made by me to Winthrop Howe, on the third day of December, A. D. 1828, and recorded as aforesaid, book 285, page 64, the amount due on said mortgage forming a part of the consideration of this conveyance. To have and to hold the abovegranted premises to the said Richard, Samuel and Thomas, and their heirs and assigns, to their use and behoof forever. And I, the said Harrison, for myself and my heirs, executors and administrators, do covenant with the said Richard, Samuel and Thomas, and their heirs and assigns, that I am lawfully seized in fee of the afore-granted premises; that they are free from all incumbrances except said mortgage to Winthrop Howe; that I have good right to sell and convey the same to the said Richard, Samuel and Thomas, and their heirs and assigns forever as aforesaid; and that I will, and my heirs, executors and administrators shall warrant and defend the same to the said Richard, Samuel and Thomas, and their heirs and assigns forever, against the lawful claims and demands of all persons except those claiming under said mortgage to Winthrop Howe.

In witness whereof I, the said Harrison G. Howe, together with Caroline Howe, my wife, who executes these presents in token of her relinquishing all right of dower in the premises, have hereunto set our hands and seals this second day of January, in the year of our Lord eighteen hundred and thirty-two. H. G. Howe (seal), Caroline Howe (seal).

Signed, sealed and delivered in presence of us: Samuel F.

Haven, Samuel S. Lawrence.

COMMONWEALTH OF MASSACHUSETTS. MIDDLESEX, SS.

Lowell, January 3, 1832.

Then personally appeared the above-named H. G. Howe and acknowledged the above instrument to be his free act and deed before me,

WM. HILLIARD, Jr.,

Justice of the Peace.

MIDDLESEX, ss.
Received and recorded by

January 3, 1832.

WM. F. STONE, Reg.

A true copy of record, book 310, page 51.

Attest: CHAS. B. STEVENS, Req.

Lib. 269, fol. 211.

Dated April, 3d, 1826. Rec. July 25th, 1826.

Winthrop Howe to Abraham Howe. \$1,000.

"A piece of land in Belvidere Village, in Tewksbury aforesaid, bounded: Beginning at a stake and stones, thence running twenty-one feet southerly, to a stake and stones; thence easterly about four rods, to a stake and stones; thence northerly twenty-one feet, to a stake and stones; thence westerly four rods to the first bound.

"Also another piece situate in Belvidere Village: Beginning at a stake and stones, thence running one hundred and two feet southerly, to a stake and stones; thence easterly fifty feet, to a stake and stones; thence northerly eighty-five feet, to a stake and stones; thence westerly thirty-six feet, to the first bound, with the building thereon, with a privilege or use to the water in case there shall be more than sufficient to carry my factory or wheels, as they now are, and the grist-mill."

Hab. in fee. Full warranty.

Lib. 269, 212. April 3d, 1826. July 25th, 1826. Winthrop Howe to Windsor and Jeroboam Howe. \$2,000.

"A piece of land situate in Belvidere, in Tewksbury aforesaid, bounded: Beginning at a stake and stones at land of William Wyman, thence westerly four rods, to a stake and stones; thence southerly seventy-one feet, to a stake and stones; thence easterly about four rods, to a stake and stones; thence northerly seventy-one feet, to the first bound.

"Also another piece in Belvidere aforesaid: beginning at an old stump about sixteen feet from the northeast corner of the

mill, thence northerly on land of James Smith and J. G. Kittredge, as the fence now stands, eleven rods and eighteen links, to a stake and stones; thence westerly four rods, to an apple-tree; thence northerly about twelve feet to a stake and stones, to land I have this day conveyed to Abraham Howe; thence westerly about four rods, on land of said Abraham, to a stake and stones; thence south about twelve rods to land I have this day conveyed to said Abraham; thence easterly thirty-six feet, to a stake and stones; thence westerly eighty-five feet, to a stake and stones; thence westerly fifty feet, to a stake and stones; thence southeasterly about ten rods, to a stake and stones; thence northerly nine rods and fourteen links, to the first bound, with the building thereon, including the grist-mill and barn, with a privilege to the water when there is more than enough to carry my factory wheels, as they now are."

Hab. in fee. Full warranty.

Lib. 280, 470. May 12th, 1828. May 13th, 1828.

Abraham Howe to Daniel T. Curtis. \$125.

"A piece of land situated in Tewksbury aforesaid, in Belvidere Village so called, bounded as follows: Beginning at a stake at the northwest corner of the premises which makes the southwest of a lot of land now owned by Windsor and Jeroboam Howe, thence running nearly south twenty feet, to the inside of the north wall of the sluiceway leading from the grist-mill; thence running easterly by said wall, as it now stands, thirty-eight feet, to a stake; thence running north fifteen feet, to a stake by land of said Windsor and Jeroboam; thence westerly, by land of said Windsor and Jeroboam to the bound first mentioned, together with the building, used as a blacksmith's shop, on the premises, be the same more or less."

Hab. in fee, with all privileges and appurtenances.

Lib. 280, 471. May 12th, 1828. May 13th, 1828.

Abraham Howe to Daniel T. Curtis. \$1,500

"A piece of land lying and situate in Belvidere Village, in said Tewksbury, bounded as follows: Beginning at the northwest corner of the premises to be conveyed, making the southwest corner of a lot of land conveyed to me this day by said Abraham, thence running easterly to a stake and stones, thirty-eight feet; thence running southerly, by land conveyed to me this day by Windsor and Jeroboam Howe, to a stake seventy feet; thence westerly, as by deed of said Windsor and Jeroboam, fifty feet to a stake and stones; thence north eighty-two feet to the first bound, said distance from bound to bound, be the same more or less, with the buildings thereon, together with the privilege of drawing water, as conveyed to me by deed of Winthrop Howe, dated April 3d, 1826, and recorded with Middlesex Deeds, lib. 269, fol. 211."

Hab. in fee. Full warranty.

Lib. 280, fol. 474. May 12th, 1828. May 13th, 1828. Windsor and Jeroboam Howe to Daniel T. Curtis. \$1,800. "A certain tract or parcel of land lying in Tewksbury aforesaid,

and situated in Belvidere Village, so called, bounded as follows, to wit: Beginning at a stake at the northwest corner of the premises which makes the southwest corner of land of said Windsor and Jeroboam, thence running south one hundred and one feet to a stake, by land conveyed to me this day, by Abraham Howe; thence running easterly, thirty-six feet, to a stake; thence running south, by land of said Abraham Howe, eighty-five feet, to a stake; thence westerly, by said Abraham Howe's land, fifty feet, to a stake; thence southerly, eighty feet, to a stake; thence southeasterly, seventy-eight feet, to a stake and stones by land of Captain Nathan Hunting; thence running by said Hunting's land, and land of James Smith, one hundred and sixty feet, to an old oak stump; thence running northerly by land of J. G. Kittredge, and on the bank of what is high-water mark, one hundred and eighty-two feet, to a stake and stones by land of said Windsor and Jeroboam; thence running westerly, by land of said Windsor and Jeroboam, one hundred and thirty-five feet to the bound first-mentioned, said distance from bound to bound, be the same more or less, together with the grist mill, and all other buildings standing on said premises, with the privilege of using the water, as conveyed to us by Winthrop Howe, by deed dated April 3d, 1826, and recorded lib. 269, fol. 212."

Hab. in fee, with all appurtenances and privileges.

Lib. 308, fol. 486. Sept. 6th, 1831. Dec. 31st, 1831. Daniel T. Curtis to Richard Warren, S. F. Barry, and Thomas B. Park. \$7,000.

"A certain piece of land, situated in that part of Tewksbury called Belvidere, bounded as follows, viz.: Beginning at the northwest corner of the premises herein granted, at the point where the same joins the land of Abraham Howe on one side, and Harrison G. Howe on the other, at a stake and stones; thence running south three degrees east one hundred and sixteen feet, by land of H. G. Howe; thence south eight degrees east sixteen and a-half feet, by land of said Howe; thence south ten and a half degrees, east by land of said Harrison, sixty-seven feet; thence south seventeen degrees east eighty-one feet, by land of said Harrison; thence south forty-eight and a quarter degrees east seventy-six feet, by land of said Harrison; thence turning and running north six degrees west one hundred and fifty-four feet, on land of Charles Barber, H. G. Howe, and Joseph Upton; thence north fifty-two and a quarter degrees east nineteen feet, on land of Howe and Upton; thence north twelve and a quarter degrees east one hundred and fifty-four and a half feet, on land of Hale Clements, and J. G. Kittredge; thence turning and running north eightythree and three-quarter degrees, west one hundred and thirty-two feet, on land of said Abraham Howe, to the point begun at, meaning hereby to convey the same land heretofore by me purchased of Abraham Howe, and of Windsor and Jeroboam Howe, by their three deeds dated the 12th May, 1828, with all the privileges, rights, and appurtenances to said premises belonging, and however the same may be bounded, and be the same more or less."

Hab. in fee. Full warranty.

DANIEL T. CURTIS TO WARREN, BARRY & PARKE. September 6, 1831.

WINTHROP HOWE

то

H. G. HOWE.

OCTOBER 23, 1828.

H. G. HOWE

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WARREN, BARRY & PARKE.

January 2, 1832.

Lib. 334, fol. 9. Jan. 24th, 1834. July 1st, 1834. Richard Warren, Samuel F. Barry and Thomas B. Parke, to Samuel Whitwell, George Bond, Benjamin Seaver and George William Bond.

Hab. in fee. Full warranty, \$25,000.

"The flannel factory of us the said Warren, Barry & Park, with the water wheels and gearing thereof. Also a two-story red building, lying southerly of said factory; also a small bleachinghouse, lying northerly of said factory; also a drying and dye house on Mechanic street, lying westerly of the factory, together with all the land under and belonging to said factory, and other buildings, intending to include the land between Concord street and Mechanic street, southerly of a lot of land formerly sold by us to William Eager, together with a right to draw and use the water of Concord river for the purpose of carrying the works of said factory; but this right is to be exercised only when there is sufficient water for the Middlesex Company's rights. Also a two-story wooden dwelling-house, and the land under and belonging to the same, situated on or near Concord street. For a more full and accurate description and understanding of the premises hereby intended to be conveyed, reference is to be had to a plan of property of said Warren, Barry & Park, drawn by A. Wadsworth, and recorded with Middlesex Deeds, on or about the twenty-sixth day of May, A. D. 1832, which said plan is hereby made a part of these presents. Also the lots of land in said Tewksbury, represented and numbered on said plan as follows, viz. : Lot No. one, containing about eleven thousand square feet; Lot No. twelve, containing 2,942 square feet; Lot No. thirteen, containing 3,869 square feet; and lots numbered respectively sixteen, seventeen, and eighteen, each containing thirty-five hundred square feet, together with all the rights, easements, privileges, and appurtenances to the aforesaid premises belonging, meaning by these presents to convey to the said Whitwell, Bond, Seaver & Bond, all the right, title and interest we have in and to the real estate situated as aforesaid, which we have heretofore purchased of H. G. Howe and Daniel T. Curtis, and which has not heretofore been sold, together with the water privileges, and all other privileges connected thereto not heretofore conveyed."

Lib. 314, fol. 347. March 1st, 1832. June 18th, 1832. Warren, Barry and Parke to James Stewart and King D. Stewart. \$1,265.75.

"A certain piece of land in that part of said Tewksbury called Belvidere Village, bounded as follows: Northerly by a lot numbered thirteen on a plan of land belonging to said Warren, Barry and Park, drawn by Alexander Wardsworth and dated on the twenty-sixth day of May, eighteen hundred and thirty-two, to be recorded in the records of the Registry of Deeds for said County of Middlesex, on the day of the record hereof; easterly by Concord street, so called; southerly in part by Brown street and partly by lot numbered fifteen on said plan; and westerly by land now or formerly of Winthrop Howe. The premises hereby granted compose the lot numbered fourteen on said plan and contain four thousand and sixty-three square feet of land, more or less, together with a right to

use one twenty-fifth part of the water of Concord river in common with said Warren, Barry and Park, their heirs and assigns; but this right is to be exercised subject to the rights following, that is to say, only when there is sufficient water for the Middlesex Company's right, and also for the works of the flannel factory and fulling-mill owned by said Warren, Barry and Park, near the premises, as said works now are, or with the substitution of an iron wheel similar to that in the Middlesex Company's wooden building; and also for the works of Holmes' card and whip factory, together with all the privileges and appurtenances to the premises belonging; reserving, however, to Warren, Barry and Park aforesaid, their heirs and assigns, a right to carry and maintain two canals through the premises wherever convenient to them, by covering them up securely if required."

Hab. in fee.

Lib. 312, fol. 540. April 1st, 1832. May 19th, 1832. Warren, Barry & Parke to Abijah Brown, Samuel Garland and Jeremiah Garland. \$990.94.

"A certain piece of land, with the buildings thereon, situated in that part of said Tewksbury called Belvidere Village, bounded and described as follows, viz.: Beginning at the northeast corner of said piece, thence running north eighty-eight and one-quarter degrees west, on land sold to Stewart, seventy-one feet and three inches; south twelve and one-half degrees west, on land now or late of Winthrop Howe, fifty feet; south seventy-six and one-half degrees east, on land of the grantors, seventy-feet; and thence running north thirteen degrees east, on Mechanic and Brown streets, so called, sixtythree feet and three inches, - or however otherwise bounded, - containing three thousand nine hundred and sixty-three and three-quarter's square feet, more or less, being lot number fifteen on a plan of the premises drawn by A. Wadsworth, with all the privileges and appurtenances thereof; also a right to use the water of Concord river in common with twenty-four other equal privileges; but this right is to be exercised only when there is sufficient water for the Middlesex Company's right, and also for the works of the neighboring flannel factory and fulling-mill as they now are, or with the substitution of an iron wheel similar to that in the Middlesex Company's wooden building, and when there is also sufficient water for the card factory near the premises. But we do reserve to ourselves, and our heirs and assigns, the unmolested right forever to have a canal running through the premises, the same with or similar to that now running under the building on the land hereby conveyed."

Hab. in fee.

Lib. 314, fol. 351. June 12th, 1832. June 18th, 1832. Warren, Barry & Parke to Joseph G. Kittredge. \$1,350.

"A certain piece or parcel of land situated in that part of said Tewksbury called Belvidere Village; said lot or piece of land contains fifty-four hundred square feet, more or less, and is the same lot which is numbered ninetcen upon a plan of the premises and other land belonging to said Warren, Barry and Park, drawn by Alexander Wadsworth, which plan is dated on the twenty-sixth day of May, eighteen hundred and thirty-two, and is recorded in the records of the Registry of Deeds for said County of Middlesex, on the day of the recording hereof, together with a right to use two twenty-fifth parts of the water of Concord river at the premises, in common with said Warren, Barry and Park, their heirs and assigns, but this right is to be exercised subject to the rights

following: that is to say, only when there is sufficient water for the Middlesex Company's right, and also for the works of the flannel factory and fulling-mill owned by said Warren, Barry and Park, near the premises, as said works now are, or with the substitution of an iron wheel similar to that in the Middlesex Company's wooden building, and also for the works of Holmes' card and whip factory, together with all other the privileges and appurtenances to the premises belonging; said Warren, Barry and Park reserving a right to themselves to take stone from said lot to finish Mechanic street with, and to build the underpinning for their dry-house on said street."

Hab. in fee.

Note.—W., B. and P. had previously conveyed —	
	$\frac{3}{25}$
Oct. 1st, 1832 — Lots 6, 7, 8, 9, 10, 11, to Alpheus Smith,	
with	$\frac{6}{25}$
Mar. 1st, 1832 — Lib. 314, fol. 347, Lot 14, to James Stewart,	,
et al., with	25
Brown, et al., with	. 1
June 12th, 1832 — Lib. 314, fol. 351, Lot 19, to J. G. Kit-	25
tredge, with	2
Jan. 2d, 1832 — Holmes' card factory, to William Eager,	2 9
with $10 \times 2\frac{1}{2}$	25
•	
Total	$\frac{14}{25}$

Lib. 353, fol. 326. April 28th, 1835. June 30th, 1836. Whitwell, Bond et al. to Walter Farnsworth, Eliphalet Baker and George Hill. One undivided third to each. \$7,366.66.

Same premises as in 334.9.

Hab. in fee, with all privileges and appurtenances thereto.
Note. — For rest of title, see deed of Farnsworth et al. to Hart,
lib. 582, fol. 176, given post.

HOLMES' CARD AND WHIP FACTORY.

Lib. 310, fol. 103. Jan. 2d, 1832. Jan. 23d, 1832. Warren, Barry & Park to William Eager. \$3,000.

Hab. in fee. Full warranty.

"A piece of land in that part of Tewksbury, in the County of Middlesex and Commonwealth aforesaid, called Belvidere Valley, with the buildings thereon, consisting of a card and whip factory, and bounded as follows, viz.: Beginning at the southeast corner thereof and running north 87½° west, fifty-nine feet and eight inches to Mechanic street, so called; thence on said street north 13½° east, seventy-six feet and seven inches to Brown street, so called; thence on said street south 87° east, four feet ten inches to Concord street; thence south 2° west, seventy-four feet and nine inches on said street to the point of beginning. Containing 3.916 square feet, more or less, as laid out on a plan drawn by A. Wadsworth, and re-measured by John Bennett, surveyor, together with a privilege to use water from Concord river to the amount of twenty-four

square inches under the present head of water at the place where the wheel in Holmes' card factory now stands, meaning to grant no more water than will run through said Holmes' present gate (which is ten inches wide) when the same is lifted or open two and a half inches and no more. But said Eager, his heirs and assigns, are to have this right only when there is sufficient water for the Middlesex Company's right, and also for the works of the flannel factory and fulling-mill adjoining the premises as they now are or with the substitution of an iron wheel similar to that in the Middlesex Company's wooden building. The premises are a part of the property conveyed to us by H. G. Howe. We do hereby reserve to us and to our heirs and assigns the right to have a canal running through the land or under the building aforesaid, the same with or similar to that now running through the premises, without the hindrance or molestation of said Eager or his heirs or assigns forever."

Lib. 311, fol. 230. Jan. 2d, 1832. Feb. 17th. Wm. Eager to Warren, Barry & Parke. \$2,500. Mortgage of same premises.

Lib. 388, fol. 546. Jan. 10th, 1834. Dec. 27th, 1839. Warren, Barry & Parke to Whitwell, Bond, Seaver & Bond. Assignment of the above mortgage.

Lib. 422, fol. 527. Dec. 5th, 1842. Jan. 12th, 1843. Wm. Sturgis to Walter Farnsworth, E. Baker and George Hill.

Same premises by similar description.

"And I hereby assign to the said Farnsworth, Hill & Baker all my right and interest in and to the said premises under and by virtue of a mortgage made by William Eager to Warren, Barry & Parke, by said Warren, Barry and Parke assigned to Whitewell, Bond & Co., and by Whitewell, Bond & Co. assigned to me, Sturgis, and all benefit of possession and judgment, for the purpose of foreclosing.

Hab. in fee.

Lib. 420, fol. 601. Aug. 17th, 1842.

Wm. Eager became bankrupt, and his right of redemption from the above mortgage was sold by his assignee at public auction and bought by Eager for \$5.

Lib. 422, fol. 526. Dec. 5th, 1842. Jan. 12th, 1843. William Eager to Farnsworth, Hill & Baker. One barleycorn Q. C. of the above described premises, in order to perfect the title. Note. — For rest of title see deed of Farnsworth to Hart, lib. 582, fol. 176, given post.

Lots 6, 7, 8, 9, 10, 11.

Lib. 318, fol. 499. Oct. 1st, 1832. Dec. 31st, 1832. Warren, Barry & Parke to Alpheus Smith, \$3.500.

Hab. in fee. Full warranty.

"Six pieces of land in that part of said Tewksbury called Belvidere Village. Said lots or pieces of land are numbered respect-

ively, six, seven, eight, nine, ten, eleven, on a certain plan of land belonging to us, drawn by Alexander Wadsworth, and bearing date on the twenty-sixth day of May last and recorded with Middlesex Deeds, to which plan reference is to be had for the boundaries and dimensions of the premises. The above lots contain in all fifteen thousand seven hundred and sixty-eight square feet of land, more or less, with all the privileges and appurtenances to the premises belonging, particularly the right to use six twentyfifth parts of the water of Concord river at the premises in common with said Warren, Barry and Park, their heirs and assigns, but this right is to be exercised subject to the previous rights following, that is to say, only when there is sufficient water for the Middlesex Company's right, and also for the works of the flannel factory and fulling-mill owned by us near the premises, as said works now are, or with the substitution of an iron wheel similar to that in the Middlesex Company's wooden building, and also for the works of Holmes' card and whip factory. Reserving, nevertheless, to us and our heirs and assigns the unmolested right forever to have a canal running through the premises, the same with, or similar to, the present canal there. It is also further provided that said Smith, his heirs or assigns, will not suffer any iron waterwheel to be used at the premises, but that the wheels shall correspond with those used by others having equal privileges near the premises, and that we, or our heirs or assigns, owning the flannelmill aforesaid shall have the right to stop the wheels which may be used at the premises whenever there shall not be sufficient water in Concord river for the previous water-rights aforesaid. And also said Smith, his heirs or assigns, shall not build, or suffer to be built, any buildings on said lots numbered six, seven and eight, within ten feet of the easterly line of Concord street, it being, however, agreed that we and our heirs and assigns shall have the right to keep our flannel factory standing where it now is."

Lib. 331, fol. 159. Oct. 1st, 1832. April 5th, 1834.

Alpheus Smith to Hazen Elliot. \$727.25.

"A certain piece of land situated in said Tewksbury, in Belvidere Village, containing 2,911 square feet, and thus bounded, to wit: Beginning at a street called Concord street, at the corner of land belonging to Hale Clements, and thence running east on said Clements' land 95 feet 3 inches, thence southerly 30 feet, thence westerly parallel with the first-described bound about 99 feet to the street first mentioned, thence northerly on said street 30 feet to the point of beginning, with 1-25th part of the water in Concord river, subject, however, to the restrictions and reservations contained in a deed of said premises and other lands made to me by Messrs. Warren, Barry and Parke, bearing even date with these presents. Said premises contain the lot numbered six and about 1-5th of the lot number seven on a plan of said premises, bearing date May 26th, 1832, recorded with the deeds of Middlesex, to which reference is to be had and allowed."

Hab. in fee, with all privileges and appurtenances.

Lib. 341, fol. 483. May 25th, 1835. May 26th, 1835.

Hazen Elliot to John Nesmith. \$2,500.

The premises above-described, with 1-25th of the water. Hab. in fee.

Lib. 380, fol. 311. Feb. 12th, 1839. Feb. 27th, 1839.

John Nesmith to the Whitney Mills. \$2,000.21.

"A certain lot of land situated in Lowell, on the easterly side of Concord river, with part of a stone building standing thereon, being part of the same estate which was conveyed to Alpheus Smith by Warren, Barry & Park, by their deed dated October 1st, 1832. The premises intended to be included in this conveyance being lots No. 6 and part of No. 7, as drawn upon a lot of lands belonging to Messrs. Warren, Barry & Parke, drawn by Alexander Wadsworth, May 26th, 1832, recorded with Middlesex Deeds, being the same premises which Alpheus Smith conveyed to Hazen Elliot, by deed dated October 1st, 1832, and which said Elliot conveyed to me, by deed dated May 25th, 1835, subject to a covenant with said Smith, dated May 28th, 1835, respecting the unobstructed passage of water from the wheel in said building through said premises."

Hab. in fee, with all privileges and appurtenances.

Lib. 348, fol. 190. Nov. 28th, 1835. Rec'd, ditto. Alpheus Smith to Seth-Ames and George Brown. \$10,000.

Smith conveyed all his real estate, and amongst it "another lot of land in said Belvidere, near Concord river, with all the water privileges and appurtenances belonging thereto, and having a large stone building thereon, being the same premises which were conveyed to me in October, 1832, by Warren, Barry & Parke, except so much thereof as I have heretofore conveyed to Hazen Elliot and Abner Ball, said estate being subject to a mortgage from myself to said Warren, Barry & Parke, to secure the sum of \$2,800."

Hab. in fee, in trust nevertheless for creditors.

Lib. 354, fol. 378. May 10th, 1836. July 22d, 1836. Seth Ames and George Brown to Josiah Brown. \$2,200.

As assignees of Alpheus Smith, and in pursuance of assignment, "lot conveyed to Smith by Warren, Barry & Parke, with all mill-rights, privileges, and appurtenances, except so much of northerly part as was conveyed by Smith to Hazen Elliot, and by said Elliot to John Nesmith." Subject to mortgage, etc.

Hab. in fee.

Lib. 377, fol. 432. Dec. 10th, 1838. Jan. 2d, 1839. B. F. Varnum, adm't'r Josiah Brown, to Joel Stone. \$47.

Administrator's deed to pay debts pursuant to license. "All that lot of land, with the buildings thereon, situate in said Lowell, in Belvidere Village, at and near Concord river, formerly belonging to Alpheus Smith, being the same premises that were conveyed to

said deceased by Seth Ames and George Brown, assignees of said Smith, by their deed dated May 12th, 1836. For a further description thereof, and all the privileges, water-rights, easements, conditions, restrictions and appurtenances belonging thereto, reference is to be had to said deeds."

Hab. in fee, "in the same manner and upon the same conditions as the same were held by said deceased."

Lib. 377, fol. 433. Dec. 10th, 1838. Release of dower by Phœbe V. Brown, widow of Josiah Brown, in the above-described premises. \$10.

Lib. 377, fol. 433. Dec. 10th, 1838. Jan. 2d, 1839. Joel Stone to Seth Ames. \$53.

"The same premises which were conveyed by Seth Ames and George Brown, as assignees of Alpheus Smith, to Josiah Brown, by deed, dated May 12th. 1836, and which were this day sold at public auction by B. F. Varnum, as administrator upon the estate of said Brown, now deceased, and pursuant to a license of the Probate Court of this county, for a description of the premises, and of water-privileges, easements, conditions, and restrictions incident or belonging thereto, reference may be had to said deed, and also to all other deeds referred to in either of the same."

Hab. in fee.

Lib. 380, fol. 309. Feb. 12th, 1839. Feb. 27th, 1839.

Seth Ames to the Whitney Mills. \$1,350.58.

All of the lots conveyed by Warren, Barry & Parke to Alpheus Smith, except so much as was conveyed to Hazen Elliot, viz.: lots 9, 10, 11, 8, and part of lot 7, on Alex. Wadsworth's plan, with water-privileges, as in deed to Smith; and reference may be had to said deeds and plan for a more particular description of the premises, and of the water privileges, etc."

Hab. in fee. Warranty against all persons claiming under

Smith.

Lib. 445, fol. 178. April 19th, 1844. June 20th, 1844.

The Whitney Mills to Baker, Hill & Farnsworth.

The blanket factory, i. e., same lot of land as was conveyed by Warren, Barry & Park to Alpheus Smith, by deed dated Oct. 1st, 1832, excepting so much of said lot as lies on the north side of a line drawn across the same, parallel to the north side of said building, and distant from the same four feet; with all the privileges, appurtenances, water-rights, etc, as in said deed to Smith, subject to right of J. D. Sturtevant in water and canal across said land, as conveyed to him by deed, dated April 2d, 1844.

Hab. in fee. Full warranty.

Lib. 563, fol. 509. May 14th, 1850. May 21st, 1850. Eliphalet Baker to Walter Farnsworth. \$10,000.

One undivided third of the property described in next deed. Similar description.

Hab. in fee.

Lib. 582, fol. 176. Nov. 26th, 1850. Nov. 30th, 1850. Walter Farnsworth to Henry Brown Hart. \$4,564.54.

"Two undivided thirds of the following described lots or parcels of real estate, to wit: A certain lot of land situated in Lowell, in the County of Middlesex and said Commonwealth, bounded and described as follows, viz.: Beginning at the northwest corner of the premises at land conveyed to me the said Farnsworth, one George Hill and one Eliphalet Baker, by Samuel Bond, George Bond, Benjamin Seaver and George W. Bond, being lot No. 1 on the plan hereinafter mentioned, and at land now, or late, of John Nesmith; thence running easterly about fifty feet to Fayette street; thence running southerly on said street, on the westerly side thereof, about thirty-five feet, to land conveyed by Joseph G. Kittredge to Wilson & Coffin, by deed dated May 9th, 1842; thence running westerly on said Wilson & Coffin's land about fifty eight-feet to said Farnsworth, Baker and Hill's land; thence running northerly on the lastmentioned land, about thirty-five, to the point of beginning. Intending hereby to convey to the said Hart two undivided third parts of the same premises conveyed to the said Baker, Hill and myself, by Joseph G. Kittredge, by deed dated May 9th, 1842, recorded in the Registry of Deeds for said County of Middlesex, book 420, page 529. Also a certain other lot of land situated in said Lowell, on the east side of Concord river, with a stone building thereon, formerly occupied as a blanket factory by the Whitney Mills, being the same lots of land that were conveyed by Richard Warren, Samuel F. Barry and Thomas B. Park to Alpheus Smith, by deed dated October 1st, 1832, except so much of said lot as lies on the north side of said building, and distant from the same four feet, with the privileges, appurtenances, and water-rights and privileges, and subject to all the conditions, limitations and restrictions that are set forth at large in said deed to said Smith, to which, as the same is found at large recorded, reference is to be had, and subject also to the right J. D. Sturtevant, his heirs and assigns, in the water of said river and in the canal across said lot of land to the extent of his portion of the water as conveyed by said Whitney Mills to him, by deed dated April 3d, 1844. Intending hereby to convey to the said Hart two undivided third parts of the same premises, appurtenances, and water-rights conveyed by the Whitney Mills to said Baker, Hill and myself, by deed dated April 19th, 1844, recorded in Middlesex Registry of Deeds, book 445, page 178. Also a certain other lot of land, with the buildings thereon, situated in said Lowell, and thus bounded and described, to wit: Beginning at the northwest corner of the premises, at the intersection of the easterly line of Mechanic street with the south line of Brown street; thence running easterly on said Brown street forty-four feet to a street formerly called Concord street, now

Howe street; thence southerly to said Howe street, seventy-four feet and nine inches; thence westerly fifty-nine feet and eight inches to said Mechanic street; thence northerly on said Mechanic street, seventy-six feet and seven inches to the point of beginning. Intending hereby to convey to the said Hart two undivided third parts of the premises conveyed to the said Baker, Hill and myself, by William Sturgis, by deed dated Dec. 5th, 1842, recorded in said Registry of Deeds, book 422, page 527. Also two undivided third parts of the following described real estate situated in said Lowell: "The flannel factory," in that part of said Lowell called Belvidere, formerly the property of the said Warren, Barry & Parke, with the water-wheels and gearing thereof. Also a twostory red building lying south of said factory. Also a small bleaching-house lying northerly of said factory. Also a dyeing and dye-house on Mechanic street, lying westerly of said factory, together with all the land under and belonging to said factory, and other buildings, intending to include the land between Concord street, now called Howe street, and Mechanic street, southerly of a lot of land formerly sold by said Warren, Barry & Parke, to William Eager, being the third lot above described, to with a right to draw and use the water of Concord river for the purpose of carrying the wheels of said factory, but this right is to be used only when there is sufficient water for the Middlesex Co.'s rights. Also a two-story wooden dwelling-house and the land under and belonging to the same, situated on or near said Howe street. For a more full and accurate description of the premises hereby intended to be conveyed, reference is to be had to a plan of property of said Warren, Barry & Park, drawn by Alexander Wadsworth and recorded in said Registry of Deeds at the end of book 314. Which plan on the said record thereof is hereby made part of these presents. Also the lots of land in said Lowell represented and numbered in said plan as follows, viz.: No. 12, containing 2,942 square feet, and lot No. 1, containing 1,489 feet. Also a lot of land bounded and described as follows, to wit: Beginning at the northwest corner thereof at land of Thomas Nesmith and land of heirs of H. Davidson, thence running easterly on said Nesmith's land seventy feet to said Mechanic street; thence running southerly on said Mechanic street about seventy-eight feet to land of Middlesex Co.; thence running westerly on said Middlesex Co.'s land seventy feet to said heirs' land, thence running northerly on said heirs' land about seventy-eight feet to the point of beginning, being a part of lots sixteen and seventeen on said plan. Together with all the rights, easements, privileges and appurtenances to the same belonging, and all the mill-wheels and gearing belonging thereto. The water-power hereby granted is subject to the prior rights of Thomas Hurd, his heirs and assigns, to the use of sufficient water from the mill-pond above the dam to carry a fulling-mill and three breast-wheels, each twelve feet in diameter and fifteen feet in length, with the machinery and works that may be attached to or connected with the same. The premises are also conveyed subject to the respective rights of Abijah Brown, of Samuel and Jeremiah Garland, of James and King B. Stewart, of

Joseph G. Kittredge and H. Clements, and of their respective heirs and assigns, under conveyance of sundry parcels of real estate made to them respectively by said Warren, Barry & Parke; to which conveyances, as the same are recorded in said Registry, reference is hereby made. Intending hereby to convey to the said Hart two undivided third parts of the same premises conveyed by the said Warren, Barry & Park to the said Whitwell, Bond, Seaver & Bond, by deed dated January 24th, 1834, recorded in said Registry, book 334, page 9, and by said Whitwell, Bond, Seaver & Bond conveyed to the said Hill, Baker and myself, by deed dated April 28th, 1835, recorded in said Registry, book 353, page 326, except so much thereof as Hill, Baker and myself have heretofore jointly conveyed to sundry persons; intending to convey to the said Hart all my right, title and interest in and to the above-described real estate, it being understood that my said right, title and interest is two undivided third parts thereof."

Subject to mortgage for \$5,000. Subject to lease to Charles Stott. Hab. in fee.

Lib. 582, fol. 180. Nov. 27th, 1850. Nov. 30th, 1850. George Hill to H. B. Hart. \$2,282.27. One undivided third of the above-described premises. Hab. in fee.

Lib. 592, fol. 235. March 22d, 1851. April 22d, 1851. Henry Brown Hart to Benjamin Loring. \$15,000.

"A certain lot of land situated in Lowell, in the County of Middlesex and Commonwealth of Massachusettes, bounded and described as follows, viz.: Beginning at the northwest corner of the premises at land conveyed to one Walter Farnsworth, one George Hill and one Eliphalet Baker, by Samuel Whitwell, George Bond, Benjamin Seaver and George W. Bond, being lot numbered 1 on the plan hereinafter mentioned, and at land now or late of John Nesmith; thence running easterly about fifty feet, to Fayuette street; thence running southerly on said street, on the westerly side thereof, about thirty-five feet, to land conveyed by Joseph G. Kittredge to Wilson and Coffin, by deed dated May 9th, A. D. 1842; thence running westerly on said Wilson and Coffin's land about fifty-eight feet, to said Farnsworth, Hill and Baker's land; thence running northerly on the last-mentioned land about thirty-five feet to the point of beginning. Intending to convey to the said Loring the same premises conveyed to me by the said Farnsworth and Hill, by their several deeds dated November 27th, A. D. 1850, and November 26th, 1850, recorded in the Registry of Deeds for Middlesex County, book 582, page 180 and page 176. Also a certain other lot of land situate in said Lowell, on the east side of Concord river, with a stone building thereon, formerly occupied as a blanket factory by the Whitney Mills, being the same lot of land that was conveyed by Richard Warren, Samuel F. Barry, and Thomas B. Park, to Alpheus Smith, by deed dated October 1st, A. D. 1832,

except so much of said lot as lies on the north side of said building, and distant from the same four feet, with the privileges, appurtenances, and water-rights and privileges, and subject to all the conditions, limitations, and restrictions that are set forth at large in said deed to said Smith, to which, as the same is found at large recorded, reference is to be had, and subject also to the right of S. D. Sturtevant, his heirs and assigns, in the water of said river, and in the canal across said lot of land, to the extent of his proportion of the water-power, as conveyed by the said Whitney mills to him, by deed dated April 3d, A. D. 1844. Intending hereby to convey to the said Loring the same premises, appurtenances, and water-rights conveyed to me by Walter Farnsworth and George Hill, by several deeds dated November 27th, A. D. 1850, and November 26th, 1850, recorded in the Registry of Deeds for Middlesex County, book 582, page 180 and page 176. Also a certain other lot of land with the buildings thereon, situated in said Lowell, and thus bounded and described, to wit: Beginning at the northwest corner of the premises at the intersection of the easterly line of Mechanic street with the south line of Brown street; thence running easterly on said Brown street forty-four feet, to a street formerly called Concord street, now Howe street; thence southerly on said Howe street seventy-four feet and nine inches; thence westerly fifty-nine feet and eight inches to said Mechanic street; thence northerly on said Mechanic street seventy-six feet and seven inches to the point of beginning. Intending hereby to convey to the said Loring all the premises conveyed to me by Walter Farnsworth and George Hill, by several deeds dated November 27th, 1850 and November, 26th, 1850, recorded in the Registry of Deeds for Middlesex, book 582, page 180 and page 176. Also the following described real estate situated in said Lowell, viz.: "The flannel factory," in that part of said Lowell called "Belvidere," formerly the property of the said Warren, Barry and Park, with the water-wheels and gearing thereof; also a two-story red building lying south of said factory; also a small bleaching-house lying northerly of said factory; also a dyeing and dye-house on Mechanic street, lying westerly of said factory, together with all the land under and belonging to said factory and other buildings. Intending to include the land between Concord street, now called Howe street, and Mechanic street, southerly of a lot of land formerly sold by said Warren, Barry and Park to William Eager, being the third lot above-described, together with a right to draw and use the water of Concord river for the purpose of carrying on the works of said factory; but this right is to be used only when there is sufficient water for the Middlesex Company's right. Also a two-story wooden dwelling house, and the land under and belonging to same, situated on or near said Howe street. For a more full and accurate description and understanding of the premises hereby intended to be conveyed, reference is to be had to a plan of property of said Warren, Barry and Park, drawn by Alexander Wadsworth, and recorded in said Registry of Deeds at the end of book 314, which plan on the said record thereof is hereby made a part of these presents; also the lots of land in said

Lowell represented and numbered on said plan as follows, viz.: number twelve, containing twenty-nine hundred and forty-two square feet, and lot numbered one, containing eleven thousand four hundred and eighty-nine square feet; also a lot of land bounded and described as follows, to wit: Beginning at the northeast corner thereof, at land of Thomas Nesmith and land of heirs of H. Davidson, thence running easterly, on said Nesmith's land, seventy feet, to Mechanic street; thence running southerly, on said Mechanic street, about seventy-eight feet, to land of Middlesex Company; thence running westerly, on said Middlesex Company's land, seventy feet, to said heirs' land; thence running northerly, on said heirs' land, about seventy-eight feet, to the point of beginning, being a part of lots numbered sixteen and seventeen on said plan, together with all the rights, easements, privileges and appurtenances to the premises belonging, and all the mill-wheels and gearing belonging thereto. The water-power hereby granted is subject to the prior rights of Thomas Hurd, his heirs and assigns, to the use of sufficient water from the mill-pond above the dam to carry a fulling-mill and three breast-wheels, each twelve feet in diameter and fifteen feet in length, with the machinery and works that may be attached to or connected with the same. The premises are also conveyed subject to the rights of Abijah Brown, of Samuel and Jeremiah Garland, of James and King B. Stewart, of Joseph G. Kittredge and H. Clements, and of their respective heirs and assigns, under conveyance of sundry parcels of real estate made to them respectively by said Warren, Barry and Parke, to which conveyances, as the same are recorded in said Registry of Deeds, reference is hereby made. Intending hereby to convey to the said Loring the same premises conveyed by the said Warren, Barry and Park to the said Whitwell, Bond, Seaver and Bond, by deed dated January 24th, A.D. 1834, recorded in said Registry, book 334, page 9, and by said Whitwell, Bond, Seaver and Bond conveyed to said Farnsworth, Hill and Baker, by deed dated April 28th, A.D. 1835, and recorded in said Registry, book 353, page 326, and by said Hill and Farnsworth conveyed to me, by several deeds dated November 27th, A.D. 1850, and November 26th, 1850, and recorded in said Registry, book 580, page 180 and page 176, except so much thereof as said Farnsworth, Hill and Baker have heretofore conveyed to sundry persons. tending to convey to said Loring all my right, title and interest in and to the above-described real estate. And this conveyance is made subject to the right granted by the said Farnsworth, Hill and Baker to the Proprietors of Locks and Canals on Merrimack river to flow, and subject also to a certain mortgage made by said Farnsworth, Hill and Baker to Charles Stott, dated February 2d, A.D. 1837, recorded in said Registry of Deeds, book 359, page 472, for the sum of five thousand dollars, and subject also to a lease made to the said Stott, dated August 29th, 1850."

Hab. in fee.

Lib. 642, fol. 90. July 20th, 1852. Oct. 26th, 1852.

Benjamin Loring to Walter Farnsworth. \$7,500.

One undivided half of certain premises, describing them exactly as in deed from Hart to Loring. "Intending to convey to the said Farnsworth one-half of the same premises conveyed to me by Henry Brown Hart, by deed dated the 22d March, 1851, and recorded in Registry of Deeds for Middlesex County, book 592, page 235."

Hab. in fee.

Lib. 642, fol. 193. July 20th, 1852. Nov. 12th, 1852.

Benjamin Loring to Charles Stott. \$7,500.

One undivided half of certain premises, describing them exactly as in deed from Hart to Loring. "Intending to convey to the said Stott one-half of the same premises conveyed to me by Henry Brown Hart by deed dated the 22d day of March, 1851, and recorded in Registry of Deeds for Middlesex County, book 592, page 235."

Hab. in fee.

Lib. 673, fol. 75. Nov. 15th, 1853. Nov. 19th, 1853. Walter Farnsworth and Charles Stott to Belvidere Woollen Manufacturing Co. \$10,000.

Hab. in fee.

The following described lots or parcels of real estate being the same described in two deeds by Benjamin Loring to the present grantors severally, viz.: Benjamin Loring to Walter Farnsworth, dated July 20th, A. D. 1852, recorded with Middlesex Deeds at book 642, page 90, and Benjamin Loring to Charles Stott, dated July 20th, A. D. 1852, recorded with Middlesex Deeds at book 642, page 193; each of said deeds conveying to the grantees therein named one undivided half of the said lots or parcels of real estate, and the said lots or parcels are by this present instrument conveyed whole and entire to said corporation, and they are described as follows, that is to say: A certain lot of land in said Lowell, bounded and described as follows, viz.: Beginning at the northwest corner of the premises at land conveyed to one Walter Farnsworth and others by Samuel Whitwell and others, being lot numbered 1 on the plan hereinafter mentioned, and at land now or late of John Nesmith; thence running easterly about fifty feet to Fayette street; thence running southerly on said street, on the westerly side thereof, about thirty-five feet to land conveyed by Joseph G. Kittredge to Wilson and Coffin by deed dated May 9, A. D. 1842; thence running westerly on said Wilson and Coffin's land about fifty-eight feet to land of said Farnsworth and others; thence running northerly on the last mentioned land, about thirtyfive feet to the point of beginning; it being the same lot described first in the said deeds by said Loring to said Stott and to said Farnsworth. Also a certain other lot of land situated in said Lowell on the east side of Concord river, with a stone building thereon, formerly occupied as a blanket factory by the Whitney

mills, being the same lot of land that was conveyed by Richard Warren and others to Alpheus Smith by deed dated October 1st, A. D. 1832, except so much of said lot as lies on the north side of said building, and distant from the same four feet, with the privileges and appurtenances and water-rights and privileges, and subject to all the conditions, limitations and restrictions that are set forth at large in said deed to said Smith, to which, as the same is found at large recorded, reference is to be had, and subject to all the right of S. D. Sturtevant, his heirs and assigns, in the water of said river and in the canal across said lot of land to the extent of his proportion of the water-power, as conveyed by said Whitney mills to him by deed dated April 3d, A. D. 1844; it being the same lot described secondly in said deeds by Benjamin Loring to the said Farnsworth and Stott. Also a certain other lot of land with the buildings thereon, situated in said Lowell, and thus bounded and described, to wit: Beginning at the northwest corner of the premises at the intersection of the easterly line of Mechanic street with the south line of Brown street; thence running easterly on said Brown street forty-four feet to a street formerly called Concord street, now Howe street; thence southerly on said Howe street seventy-four feet and nine inches; thence westerly fifty-nine feet and eight inches to said Mechanic street; thence northerly on Mechanic street seventy-six feet and seven inches to the point of beginning; it being the same lot described thirdly in said deeds by Benjamin Loring to the said Farnsworth and Stott. Also all the real estate comprehended in the fourth clause of the descriptive part of the said deeds to Farnsworth and Stott, with all the rights, privileges and appurtenances, or easements, and subject to all the restrictions in said deeds mentioned and contained, with all the buildings now standing on said real estate, and all property covered by the said descriptive clause, which is as follows, viz.: "The flannel factory in that part of Lowell called Belvidere, formerly the property of said Warren, Barry & Park, with the water-wheels and gearing thereof; also a two-story red building lying south of said factory; also a small bleaching-house lying northerly of said factory; also a dyeing and dye house on Mechanic street, lying westerly of said factory, together with all the land under and belonging to said factory and other buildings, intending to include the land between Concord street, now called Howe street, and Mechanic street, southerly of a lot of land formerly sold by said Warren, Barry & Park to William Eager, being the third lot above described, together with a right to draw and use the water of Concord river for the purpose of carrying the works of said factory; but this right is to be used only when there is sufficient water for the Middlesex Company's right. Also a two-story wooden dwellinghouse and the land under and belonging to the same, situated on or near said Howe street. For a more full and accurate description and understanding of the premises hereby intended to be conveyed, reference is to be had to a plan of property of said Warren, Barry & Park, drawn by Alexander Wadsworth, and recorded in said Registry of Deeds at the end of book 314, which plan on the said record thereof is hereby made a part of these presents; also all

the several lots of land in said Lowell represented and numbered in said plan as follows, viz.: Number twelve, containing twentynine hundred and forty-two square feet, and lot numbered one, containing eleven thousand four hundred and eighty-nine square Also a lot of land bounded and described as follows, to wit: Beginning at the northwest corner thereof at land of Thomas Nesmith and land of heirs of H. Davidson; thence running easterly on said Nesmith's land seventy feet to said Mechanic street; thence running southerly on said Mechanic street seventy-eight feet to land of Middlesex Company; thence running westerly on said Middlesex Company's land seventy feet to said heirs' land; thence running northerly on said heirs' land about seventy-eight feet to the point of beginning. Being a part of lots numbered sixteen and seventeen on said plan, together with all the rights, easements, privileges and appurtenances to the premises belonging, and all the mill-wheels and gearing belonging thereto. The water power hereby granted is subject to the prior rights of Thomas Hurd, his heirs and assigns, to the use of sufficient water from the mill-pond above the dam to carry a fulling-mill and three breast-wheels, each twelve feet in diameter and fifteen feet in length, with the machinery and works which may be attached to or connected with the same. The premises are also conveyed subject to the rights of Abijah Brown, of Samuel and Jeremiah Garland, of James and King B. Stewart, of Joseph G. Kittredge and H. Clements, and of their respective heirs and assigns, under conveyance of sundry parcels of real estate made to them respectively by said Warren, Barry & Park, to which conveyances, as the same are recorded in said Registry of Deeds, reference is hereby made; and this conveyance is made subject to the right granted by Walter Farnsworth, George Hill and Eliphalet Baker to the Proprietors of locks and canals on Merrimack river to flow. Meaning and intending to convey by this deed all the real estate and property described in and conveyed to us severally by the above-mentioned deeds of Benjamin Loring to us, the said Walter Farnsworth and Charles Stott, severally, as aforesaid.

Note. — By deeds of Farnsworth & Hill, lib. 582, fol. 176 and 180, they convey the premises conveyed by Warren, Barry & Park to Whitwell, Bond & Co., and by Whitwell, Bond & Co. to themselves, "except so much as we have previously sold." Their previous deeds are:—

Lib. 420, fol. 530. Dec. 5th, 1842. Jan. 9th, 1943. Eliphalet Baker, Walter Farnsworth, and George Hill to Jas. O. Patterson. \$831.

Hab, in fee, with all appurtenances.

"The following described premises, in said Lowell, to wit: Beginning on the west side of Mechanic street, as laid down on Wadsworth's plan, at land of said Patterson; thence running northerly on the west side of said street fifty-nine feet and five inches; then turning a right angle and running westerly seventy feet to land of Hamilton Davidson; then turning a right angle

and running southerly by said Davidson's land fifty-nine feet and five inches to land of said Patterson; then turning a right angle and running easterly by said Patterson's land seventy feet to the point of beginning, with the right or privilege of using one twentyfifth part of the surplus water of the Concord river, which remains after the full supply of the water for the Middlesex Company, and also for the full supply of water for the flannel-mill establishment of the grantors, said part of the surplus water to be taken from the penstock at the premises; reserving to said grantors and their successors the right to rest the ends of timbers on, or to enter them into, the wall which now runs across the north end of the premises, but in such a manner as not to obstruct the use of said wall and premises by the grantee. But, if said grantor takes the water from said penstock, he shall pay his proportion of the expense of keeping the same in repair in front of said Patterson's premises; and said Patterson shall pay one-half of the expense of keeping said street in repair where said street bounds on said premises. But this conveyance is made subject to all the restrictions and reservations contained in the deed to these grantors from Samuel Whitwell and others."

Lib. 425, fol. 283. May 11th, 1842. Feb. 23d, 1843.

"A covenant and agreement made and entered into this eleventh day of May, in the year of our Lord one thousand eight hundred and forty-two, by and between Walter Farnsworth, George Hill and Eliphalet Baker, all of Boston, in the County of Suffolk and Commonwealth of Massachusetts, merchants, of the one part, and Elias S. French and William L. Dustin, both of Lowell, in the County of Middlesex and Commonwealth aforesaid, mechanics, of the other part, as follows, to wit: The said Farnsworth, Hill and Baker, in consideration of four hundred and thirty-eight dollars and fifty cents, to be paid to them by the said French and Dustin, as hereinafter mentioned and expressed; and when thirty per cent. of the purchase-money, together with interest on the whole, shall be so paid, do hereby covenant and agree with the said French and Dustin that they the said Farnsworth, Hill and Baker shall and will at any time after the said thirty per cent. and interest shall be paid, and on request or demand of said French and Dustin, or either of them, their heirs, executors, administrators or assigns, convey to them, the said French and Dustin, or their legal representative, by a quitclaim-deed, the undivided easterly two third parts of the following-described lot or piece of land situate in said Lowell, in that part called Belvidere, it being Lot No. 13 on plan of Alexander Wadsworth, of land formerly owned by Warren, Barry & Park, the whole lot containing three thousand eight hundred and sixty-nine feet, more or less, and computed at seventeen cents per foot, and bounded as follows, viz.: Easterly on Howe street, so called; northerly by a court and Lot No. 12 on said plan; westerly by land of Hamilton Davidson; and southerly by land now owned and occupied by said French and Dustin, together with the privilege of drawing and using twothirds of one twenty-fourth part of the surplus water taken from

the Concord river, said water to be drawn and used on the wheel in the premises and building now owned and occupied by the said French and Dustin, and nowhere else, and hereby reserving the right and privilege of carrying water through said premises to my other place by a pent-stock, securely placed and safely covered, and to enter and repair the same at their option; and the said grantors covenant on their part that the said premises shall be free from all incumbrances whatever, since the same shall have come into their possession."

Lib. 437, fol. 55. Dec. 20th, 1843.

Assignment of the above agreement by French & Dustin to John Nesmith.

Lib. 533, fol. 198. Nov. 7th, 1847. March 29th, 1848. Q. C. in accordance with the above agreement by Baker, Hill & Farnsworth to John Nesmith.

Lib. 502, fol. 412. March 5th, 1845. April 3d, 1847. Baker, Hill & Farnsworth to Thomas Nesmith. \$210. Northerly part of Lot 16 on Alex. Wadsworth's plan. A piece of land 70 feet by 18 feet. Hab. in fee, with all appurtenances, but no water granted.

Lib. 572, fol. 512. Nov. 11th, 1847. Oct. 11th, 1850. Baker, Hill and Farnsworth to John Holt. \$219.24.

Hab. in fee with all privileges and appurtenances.

"The westerly third part of a certain lot of land which it situate in Lowell, in the County of Middlesex, in Belvidere, so called, being lot No. 13, on a plan made by Alexander Wadsworth, of land formerly owned by Warren, Barry and Park, the whole containing three thousand eight hundred and sixty-nine feet, and bounded as follows, viz.: easterly by Howe street, so called; northerly by a court and lot No. 12, on said plan; westerly by land now or formerly of Hamilton Davidson, and southerly by land of John Nesmith, formerly belonging to French & Dustin, with the privileges as appurtenant to the conveyed premises of drawing and using one third part of one twenty-fourth part of the surplus water taken from the Concord river, said water to be used on the wheel in the premises now occupied by Hapgood, Holts & Fish, and not elsewhere. Reserving, however, to the grantors and their heirs and assigns the right of conveying water through the premises to any other place, by means of a pent-stock, safely placed and securely covered, with a right to enter and to repair the same at any time. Intending hereby to convey to said Holt the same property which we bound ourselves to convey to him by an agreement in writing, bearing date May 11th, A. D. 1842. Recorded with the Middlesex Deeds, book 425, page 282, reference to which may be had."

Farnsworth, Hill & Baker have thus conveyed away one twenty-fourth plus one twenty-fifth from the amount conveyed to them by

Whitwell, Bond & Co. by deed, lib. 356, 326.

Lots 2, 3, 4 and 5.

318, 503. May 1st, 1832. Dec. 31st, 1832. Warren, Barry and Parke to Hale Clements. \$4,000.

Hab. in fee. Full warranty.

Four lots of land situated in that part of said Tewksbury called Belvidere Village, which are numbered respectively, two, three, four and five, on a plan of land belonging to us, drawn by Alexander Wadsworth, and bearing date on the twenty-sixth day of May now current, recorded or to be recorded with Middlesex Deeds, to which plan reference is to be had for the boundaries and dimensions of the premises, together with the buildings thereon situated, and other buildings connected with them and now standing on lots numbered respectively as aforesaid one and six on said plan, which latter buildings are to be removed by said Clements. Together with all the privileges and appurtenances to the premises belonging, particularly the right to use three twenty-fifth parts of the water of Concord river at the premises, in common with us, our heirs or assigns; but this right is to be exercised subject to the previous rights following, that is to say, only when there is sufficient water for the Middlesex Company's right, and also for the works of our flannel factory and fulling-mill near the premises, as said works now are, or with the substitution of an iron wheel similar to that in the Middlesex Company's wooden building, and also for the works of Holmes' card and whip factory. Reserving, nevertheless, to us, our heirs and assigns, the right to have a canal running through the front of the premises to the canal under the buildings, and also a right to carry the canal under the buildings, through the lots numbered two and three. It is provided that said Clements, his heirs or assigns, shall not permit any iron water-wheel to be used at the granted premises, but that the wheels shall correspond with those used by others having equal privileges near the premises, and that the owners of the flannel mill aforesaid, their heirs or assigns, shall have the right to stop the wheels which may be used at the premises, whenever there shall not be sufficient water in Concord river for the previous water-rights aforesaid; and also that the buildings on said granted lots shall be set on a line parallel with the line of Concord street, as shown on the plan aforesaid.

Lib. 318, fol. 505. May 1st, 1832. Dec. 31st, 1832. Hale Clemens to Warren, Barry and Parke. \$3,500. Mortgage of same premises as in 318, 503.

Lib. 365, fol. 488. Jan. 10th, 1834. July 31st, 1837. Warren, Barry and Parke to Whitwell, Bond, Seaver and Bond. Assignment of the above mortgage.

Lib. 365, fol. 489. July 15th, 1837. July 31st, 1837. Whitwell, Bond, Seaver and Bond to Benj. F. White. Assignment of the above mortgage.

May 8th, 1838.

Certificate of entry by White to foreclose the above mortgage recorded on margin of same.

Lib. 436, fol. 139. June 4th, 1839. Dec. 12th, 1843. Benj. F. White to Daniel Shattuck.
Assignment of the above mortgage.

Lib. 437, fol. 53. Feb. 4th, 1843. Dec. 21st, 1843.

Daniel Shattuck to the Whitney Mills. \$2,500.

"A certain lot of land situated in Lowell, in said county, in Belvidere, so called, at or near Concord river, with the buildings, water privileges and easements belonging thereto. Being the same estate which was conveyed by Richard Warren and others to Hale Clements, by deed dated May 1st, 1832, for a description of which estate and its boundaries, and the lots belonging thereto, and the various easements, privileges and rights incident to the same, and the conditions, limitations and restrictions to which the same is subject, reference is to be had to said deed as the same may be found recorded, book 318, fol. 503, in the Registry of this county. Intending hereby to assign all my rights under a mortgage from said Clements to said Warren and others, dated May 1st, 1832, which mortgage since came by assignment to me, and on which possession for foreclosure has been taken and maintained."

Hab. in fee, with all privileges and appurtenances.

Note.—At this date the Whitney Mills owned lots 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.

Lib. 452, fol. 18. April 2d, 1844. Oct. 17th, 1844.

The Whitney Mills to J. D. Sturtevant.

All the lot of land conveyed by Warren, Barry & Parke to Hale Clements, dated Oct. 1st, 1832, and recorded lib. 318, fol. 503.

Also, another lot of land south of and adjacent to the foregoing, being so much of the lot conveyed by Warren, Barry & Parke to Alpheus Smith as lies north of a line parallel to the north side of the stone building belonging to said corporation, and distant four feet therefrom, with all privileges, etc., as in deed to Hale Clements. Also with easement to canal across said corporation's land, with exclusive right of using the same to carry wheel.

Hab. in fee.

Lib. 562, fol. 365. Nov. 9th, 1849. Nov. 24th, 1849. J. D. Sturtevant to Ephraim and George Crosby. \$5,000. Same description as in 452, 18.

Hab. in fee, with all privileges as in deed to Clements.

Lib. 673, fol. 186. Dec. 18th, 1853. Dec. 16th, 1863. E. and G. Crosby to A. J. Richmond. \$100.

Premises conveyed by 562, 365.

Hab. in fee, with all privileges, etc. Subject to mortgage for \$5,000, which the grantee is to assume and save grantors harmless.

Lib. 672, fol. 416. Feb. 4th, 1854. Feb. 6th, 1854. A. J. Richmond to Leonard Church and Joseph Church. \$1,750. One undivided half of the lots conveyed by 673, 186, with all the privileges, etc., and subject to the conditions therein expressed.

Middlesex, North District.

June 25th, 1860. July 10th, 1860. Lib. 24, fol. 439. "Know all men by these Presents, That whereas I, Samuel W. Stickney, of Lowell, in the County of Middlesex and Commonwealth of Massachusetts, guardian of James H. Richmond, Herbert Richmond, Walter S. Richmond, Anne De Rose Richmond, Elbert W. Richmond and Bayard Richmond, minor children of Alanson J. Richmond, late of said Lowell, deceased, by an order of the Court of Probate, held at Lowell, within and for said County of Middlesex, on the fifth day of June, in the year one thousand eight hundred and sixty, was licensed and empowered to sell and pass deeds to convey certain real estate of the said minors; and whereas I, the said guardian, having given public notice of the intended sale by causing notifications thereof to be published once a week for three successive weeks, prior to the time of sale, in the newspaper called the Lowell Weekly Journal and Courier, printed at said Lowell, and having first taken the oath and given the bond by law in such cases required, did, on the twenty-fifth day of June, in the year one thousand eight hundred and sixty, pursuant to the order and notice aforesaid, sell by public auction the real estate of the said minors hereinafter described, to George Ripley, of said Lowell, and Andrew G. Hammond, of Hartford, in the State of Connecticut, for the sum of eleven thousand four hundred and eighty-seven dollars, they being the highest bidder therefor. Now, therefore, know ye that I, Samuel W. Stickney, guardian, as aforesaid, by virtue of the power and authority in me vested, as aforesaid, and in consideration of the aforesaid sum of eleven thousand four hundred and eighty-seven dollars to me paid by the said Ripley and Hammond, the receipt whereof is hereby acknowledged, do by these presents give, grant, sell and convey unto the said Ripley and Hammond, all the right, title and interest of said minor children in and to the following pieces or parcels of land, viz.: a certain piece or parcel of land, with the buildings thereon and fixtures therein, situate in said Lowell, containing about twelve thousand one hundred and sixty-three square feet, bounded westerly by a street which leads from East Merrimack street by land of the Belvidere Manufacturing Company, called Howe street, one hundred and four feet, northerly by land of said Belvidere Manufacturing Company and land of Mary E. Pearson, as is supposed, one hundred and seventeen feet; easterly by land of said Pearson, suppose, and land of Widow Daphna Noyes, one hundred and four feet, and southerly by land of said Widow Noyes and said Belvidere Manufacturing Company one hundred and seventeen feet, all the angles of said piece being right angles.

Together with their title and interest in the buildings, mills, fixtures, water privileges, and all privileges and appurtenances belonging to said several lots, or to any of them, and all the right,

title, and interest of said minors in and to the machinery in any and all the mills situate on the premises hereinbefore eonveyed."

Lib. 24, fol. 442. June 25th, 1860. July 10th, 1860.

Anna E. Richmond to Ripley & Hammond.

Release of dower by the widow of A. J. Riehmond.

"The real estate, mills, machinery, fixtures, water-power and water privileges by Samuel W. Stiekney, guardian of James H. Riehmond and others, conveyed to said Ripley and Hammond by the foregoing deed, bearing even date with these presents, unto the said George R. Ripley and A. G. Hammond, meaning and intending by this instrument to release unto the said George Ripley and A. G. Hammond all my right, title, and claim to dower in the aforesaid premises."

Hab. in fee, with all appurtenances.

Lib. 29, fol. 498. Dec. 10th, 1861. Dec. 11th, 1861.

Andrew J. Hammond to George Ripley. \$2,500.

Q. C. of the premises conveyed to Ripley and himself by

Stickney.

"The several pareels of real estate conveyed to said Ripley and myself by Samuel W. Stickney, guardian, by his deed to us dated June 25, 1860, and recorded in the Registry of Deeds for the Northern District of Middlesex at Lowell aforesaid, in book 24, page 439, to which deed, or the record thereof, reference is to be had for a description of the premises."

Hab. in fee, with all appurtenances.

Lib. 44, fol. 469. Sept. 22d, 1865. Oet. 6th, 1865. Joseph and Leonard Church and George Ripley to the Belvidere Woollen Co.

"A certain parcel of land, with the buildings thereon and fixtures therein, including the water-wheel and shafting connected directly with said wheel (but not including the machinery and other shafting), situate in said Lowell, containing about twelve thousand one hundred and sixty-three square feet, bounded westerly by a street which leads from East Merrimaek street by land of the said Belvidere Woollen Manufacturing Company, ealled Howe street; one hundred and four feet northerly by land of said Belvidere Woollen Manufacturing Company and land supposed of Mary E. Pearson; one hundred and seventeen feet easterly by said land supposed of said Pearson and land supposed of widow Daphna Noyes, one hundred and four feet, and southerly by land supposed of said Noyes, and by land of said Belvidere Woollen Manufaeturing Company one hundred and seventeen feet, all the angles of said pareel being right angles, and all the water privileges, and all the privileges and appurtenances belonging to said premises."

Hab. in fee, with all privileges and appurtenances.

Wednesday, Oct. 25, 1876.

The commissioners met at 9½ o'clock.

Joseph P. Frizell, recalled.

Q. (By Mr. Shattuck.) Have you measured the Wamesit dam?

A. Yes, sir.

Q. How long is it?

- A. The falls are 253 feet long, and then there is about 15 feet more that the water would run over, if it should rise six inches above the highest point of the flash-boards, on the side next to the canal.
 - Q. (By Mr. Butler.) Where the timber is?

A. Yes, sir.

Q. Will you give the difference of level on the flash-boards?

A. The difference between the highest and lowest points is about $3\frac{3}{4}$ inches.

Q. Now, will you give the amount of water running which would flow over the dam at different heights above the lowest

point of the dam, every day water passes?

A. I calculated it on the assumption that the flash-boards have a uniform slope from the highest to the lowest point. That may not be exactly correct, but it is approximately correct. At a depth of 1 inch, it would be $2\frac{1}{2}$ cubic feet per second; at a depth of 2 inches, it would be 13 cubic feet per second; 3 inches, 36; 4 inches, 72; 5 inches, 120; 6 inches, 178; 7 inches, 244; 8 inches, 315; 9 inches, 394; 10 inches, 478; 11 inches, 568; 12 inches, 662 cubic feet per second.

Cross-examination.

- Q. (By Mr. Butler.) This you calculated upon the supposition that there was a uniform slope from side to side in the flash-boards?
 - A. A uniform slope from the highest point to the lowest point.

Q. Is that so in fact at all?

A. It is approximately correct. The levels were taken at a number of different points. That is not far from the truth.

Q. Now, is your calculation made upon the flowing over of water as over a straight weir?

A. It is, in those small depths. It would not be correct if the water should get much higher than I have stated.

Q. No, no; is your calculation made upon the formula given for water flowing over a straight weir?

A. Yes, sir.

Q. Have you a profile, and can you give us the form of that dam? I mean, the form measured on a horizontal line. It is a zig-zag line?

A. Yes, it is very crooked; I have not got the plan. Q. How many feet long do you say is the longest space?

- A. I can't say; some 60 feet, perhaps; I am not certain about that.
- Q. Then there are some crooks, not more than 10 or 15 feet, are there not?

A. I think the straightest part is about 28 feet.

Q. How many crooks are there in the dam? Have you a profile of it?

A. I have not got a plan of it.

Q. Now, is there any formula known to engineers, by which the water flowing over such a dam, in its extreme length, can be measured; and, if so, where is that formula; in what book or what publication, anywhere?

A. I don't know of any formula specially calculated for that

dam.

Q. That is not the question. Do you think that is a fair answer? Is there any formula known to engineers, by which you can measure over a crooked weir having various sharp angles in it?

A. The ordinary formula applies very well.

Q. I did not ask you that. Again, Mr. Frizell, is there any formula laid down anywhere for measuring the water over a crooked weir?

A. Not that I know of.

Q. Is there any record that gives the amount of variation that there would be because of the different angles at which the weir was made?

A. I don't know of any.

Q. Do you know of any experiments made by which the accuracy of measurements over a dam formed as that is, have ever been tested?

A. No, sir.

Q. Do you know of any formula by which, with those angles, it could be tested?

A. I don't know of any formula; I presume that it could be figured out.

Q. Are all of your measurements of flowing water over a weir ascertained by certain formulas taken from engineering works?

A. Yes, sir.

Q. Have you ever measured before the amount of water flowing over a dam shaped like that one?

A. No, sir.

Q. Then you have simply taken a dam of the number of feet that that is in length, assuming its height, and applied the formula for a straight dam to it — is not that all?

A. That is all.

Q. As an engineer, are you not informed that one advantage of a dam with its roll-way in different angles, is, that they will dis-

charge more water than a straight roll-way? Isn't it made so for that purpose, frequently?

Mr. Shattuck. There may be a misunderstanding. Do you

mean a dam built across a river in that way?

Mr. Butler. I never knew a dam built across anything else but a river or a stream.

Mr. Shattuck. Do you mean to ask him whether that dam would discharge more water if that length was straight, instead of being crooked?

Mr. Butler. Pardon me; I mean exactly what I say, and I

would like the witness to answer the question.

Mr. Shattuck. I don't understand it.

Q. As an engineer, are you not informed that one advantage of a dam with its roll-way in different angles is, that they will discharge more water than a straight roll-way. Isn't it made so for that very purpose?

A. I have no doubt that it is made so for that purpose; but I do not think it discharges more water. It is often made so from

a misapprehension.

Q. You think it will not discharge more water?

A. No, sir; no more than a straight dam of the same length.

Q. Would a gauging upon such a dam be of any value to determine the flow of water?

A. They would be, as long as the depths were small.

- Q. Give me the reason why the value of a gauging would change with the depth of water. If it is correct for one inch, why isn't it for two?
- A. It is undoubtedly correct for 2 inches, or 6 inches; when you get up to 36 inches probably it would run over the dam very much as though it was a straight dam from one side of the river to the other.
- Q. Would not much more water go over than there would over a straight dam, running from one extremity to the other? When the water gets up high, you think more would run over a dam like this, than over a straight dam?

A. I mean when the water rises to a considerable height — two

or three feet.

Q. I don't care how high you put it. When the water is high, will more water run over such a dam as this than would run over a straight dam, in your judgment?

A. Less water would run over this dam than over a straight

dam of the same length.

Mr. Shattuck. What do you mean by these questions? I don't understand them. There is an obscurity in talking about a straight dam.

Mr. Butler. I mean a straight dam of the same length. I did

not think it necessary to put it in every time.

Commissioner Russell. There might be a straight dam across that river which would not be of the same length. I do not think the question is free from that ambiguity.

Mr. Butler. I leave out that river entirely. I have learned in this hearing that the Concord and the Sudbury rivers are different

from all other streams under heaven. Therefore, I do not put

anything in on that subject.

Commissioner Russell. I do not know that you appreciate the point I mean to make. It is, that a straight dam from one side of a river to the other is a different thing from a zig-zag dam across the same river, because the straight dam might not be more than half the length of the zig-zag dam.

Q. I am taking a straight dam of the same length. Would more water run over a straight than over a crooked one when the

water is high?

A. When the water is high, more water would run over a straight dam than over a crooked one of the same length.

Q. When the water is low, would more or less water run over a

straight dam than a crooked of the same length?

A. You might say, for any depth of water, more water would run over a straight dam than over a crooked one of the same length, but the difference is very slight for slight depths of water.

Q. Because there is a small amount of water running? But you think less water would run over that dam in its present form

than would if it was the same length and straight?

A. I think so.

Q. How much less?

A. The difference would hardly be worth taking account of as long as the depth was less, probably, than six inches.

Q. It would hardly be worth taking account of?

A. I think not.

- Q. How many feet of water would run over with a depth of six inches?
- A. A depth of six inches would flow about 1.2 cubic feet per second for every foot in length of the dam.

Q. That would give us about 300 feet?

A. It would if the depth was uniform all over the length of the dam. That is, if the top of the dam was level.

Q. If it was not level, more would run, wouldn't it?

- A. It depends upon how you are reckoning the depth. I am talking about the depth, reckoning from the lowest point of the dam.
- Q. Is there any formula given for measuring the water on a weir which is lower in the centre than it is at the ends?

A. Yes; there are formulas for that case.

Q. That is, for a dam running down to a centre?

A. Yes, sir.

Q. Who gives those?

- A. Professor Thompson, of Belfast College, gives a formula for that case.
 - Q. Did you use that formula?

A. No, sir.

Q. Why not?

A. I could do better by the ordinary formula.

Q. You had no confidence in that formula, had you?

A. That don't follow.

Q. Then why didn't you use it?

A. I could do better by the ordinary formula, by dividing the dam into lengths of ten feet, and computing the discharge for each length.

Q. Did you do so?

A. I did.

Q. Computed the discharge for each ten feet?

A. Each ten feet in length.

Q. Did you have the measurement for each ten feet?

A. No, sir, I didn't have the measurement for each ten feet.

Q. Now, I should like to ask you a question, as an engineer, whether you think that determining the amount of water in a river running over a weir of the shape that that dam would be, both in its profile and in its plan, would be a means of determining with any considerable accuracy the run of that river?

A. I stated at the commencement that it was only an approxi-

mate result.

Q. Well, "approximate"—a man approximates heaven when he does one good act. How near would the approximation be?

A. I don't think it is very far from the truth. The only chance of error is in the dam differing very much from the supposition that it slopes uniformly from the lowest point to the highest point. As I had the levels on each angle of the dam, I can say that the supposition is not very far from the truth.

 \hat{Q} . Was the water running over at the time?

A. No, not when the levels were taken.

Re-direct.

Q. (By Mr. Shattuck.) I should like to have you state what, in your judgment, is the largest allowance to be made for error on account of the angles in the dam, and on account of the assumption that there was a uniform line from the lowest point to the

highest point?

Mr. Butler. I object to that question, on the ground that he is not competent to give a judgment on that point. He threw away the only formula which deals with that question, and he never has tested the amount of inaccuracy in any way or form, as he swears, and there is no formula known to engineering science by which he could get at it, as he swears.

Q. Is not the formula that you used for every ten feet a correct

one?

A. It is called so; it is the formula that is universally employed in this region of country for measuring water over weirs.

Commissioner Russell. Is the question objected to?

Mr. Butler. I will not object, but I will try to show the utter

folly of his judgment, if he gives one.

A. For the depth of six inches, for instance, I should not expect to find the result erroneous more than 25 cubic feet per second.

Re-cross.

Q. (By Mr. Butler.) A single word upon that, Mr. Frizell. Have you ever had any means of testing or knowing anything upon that subject, — what the difference would be; and is there any engineering book which treats of that? I will divide the question. In the first place, have you yourself ever made any experiments tending to show the difference between the two measurements, one upon a straight dam and the other upon a dam which was zig-zag in form and crooked in profile?

A. I have never made any experiments on that matter.

Q. Is there any engineering book which shows any experiments and lays down any result, testing that, except Thompson's, which you threw away?

A. I am not aware that there is.

[Mr. D. S. Richardson put in a table of measurements at Massic

Falls, made by Mr. Frizell, marked "J. P. F. A."

Mr. BUTLER. I would like to examine Mr. Frizell a little about this table, because the only thing I wanted in it he left out, as, of course, he would.

- Q. I asked you to give me the amount of water diverted from the Sudbury river and the quantity which would pass the dam, had none been diverted, allowing three days for the diverted water to reach Lowell from South Framingham, in cubic feet per second. You have left both of those columns blank. Why?
 - A. I have not been able to get the tables.

Q. Why?

A. Because, as I am told, the manuscript tables are in the hands of the printer.

Mr. Butler. The tables were printed the next morning, Mr. Child says.

Q. Did you call on Mr. Child for them?

A. I did not call on Mr. Child.

Q. On whom did you call?

A. I called on Mr. Davis.

Q. When did you call on Mr. Davis?

A. The morning after I was in here.

Q. When was this table of yours completed, — this piece of paper under my hand?

A. It was completed on Monday. I intended to fill up those

columns.

Q. I didn't ask you your intention. When was this completed?

A. On Monday.

Q. When did you ask Mr. Davis for the tables by which this could be completed?

A. I went to Mr. Davis's office on Monday morning to get the evidence that was to be found,—all that was to be got.

Q. Well, will you do this now?

A. Yes, sir; as soon as I can get the paper I will fill out those columns.

Mr. Butler. Very well; then I will not object to having that come in.

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ni besu all of 74 all of 74 all of 67 er absolute	Power due to the last tity in the last supposed to be 10 hours on a f feet, assumi wheels to utiliz cent, of the secont.	Horse-powers.	:	•	•	272.68	250.28	220.81	67.48	219.62	204.42	189.07	184.08	201.70	180.83	68.64	219.24	186.12	204.56	199,76
-sald g rage for	Quantity passin sic Falls, Ave the 24 hours,	Cub. ft.	:	•	:	178.32	163.67	144.40	44.13	143.62	133.68	123.64	120.38	131.90	118.25	44.89	143.37	121.71	133,77	130.63
Brook.	Quantity of water of a second	Cub. ft.	:	:	:	6.78	6.19	6.71	6.10	5.36	5.42	5.37	5.52	5.25	5.30	5,19	4.60	3.89	3.28	3.25
E	Massic Falls.		:	•	•	:	:	•	:	:	:	:	•	:	:	:	•	•	:	:
FEET AT	Old Belvidere Mill.		•	•	•	•	•	:	•	•	:	•	:	•	•	:	:	:	:	-
FALL IN F	Wood's Mill.		:	:	•	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
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it Dam iverted, days for	Quantity that wor passed Vames allowing three of the diverted w reach Lowell fi	Cubic ft. per second.	:	:	•	194.44	176.68	156.09	61.73	154.86	140.66	124.47	126.16	135.75	118.05	48.50	147.77	133,82	130.89	129.88
by the as de-	Quantity diverte Sudbury River City of Boston, termined by th neer for the city	Cub. ft. per second.	22.9	19.2	18.4	23.7	16.6	12.4	6.2	11.3	9.1	5.1	တ္	0.6	16.0	0.4	2.5	3.4	2.9	3.9
CONCORD QUANTITY FLOW OF	Average during the day, 24 hrs.	Cub. ft.	:	•	•	171.54	157.48	137.69	38,03	138.26	128.26	118.27	114.86	126.65	112.95	39.70	138.77	117.82	130.49	127.38
THE CONCOUNT THE QUANT	Average while the Mere and a series are a series and a se	Cub. ft. per sec.	•	•	:	94.09	83.70	68.99	•	68.00	69.53	73.53	74.30	76.31	57.05	:	10.01	55.80	67.24	62.99
BY IG T BY	Average while the Mills were singing.	Cub ft.	•	:	:	235.64	241.09	215.55	•	217.89	194.82	168.98	160.82	183.71	176.30	•	216.70	188.10	202.18	200.36
FURNISI F DAM, DIMINIS	Day of the Month.		Aug. 21	22	23	24	25	26	27	. 28	29	30	31	Sept. 1			**		9	
QUANTITY OF WATER I RIVER AT WAMESIT AT MASSIC FALLS D HALE'S BROOK, 1876.	Day of the Week.		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday

"J. P. F. A."—Continued.

ed in 10 ff 15 feet, of 18 to of the	Power due to the in the last coluposed to be us assuming the nullize 75 per eel and 15 per eel assuming the nullize 75 per eel assuming the nullize 15 per eel assuming the nullize 15 per eel assuming the nullize 15 per eel nullize 15 per ee	Cub. ft. Horse-powers.	227.79	211.36	78.1	250.34	207.45	172.94	164,04	198.64	157.48	40.63	274.18	352.03	340.83	321.79	329.48	279.66	219.38
Massie 42 edt 101	Quantity passing Massic Falls, Average for the 24 hours,		148.96	138.22	51.12	163.71] 135.66	113.09	107.27	129.90	102.98	26.57	179.30	230.21	222.88	210.43	215.46	182.88	143.46
gnissag :	Quantity of water Hale's Brooks for the 24 bours	Cub. ft. per sec.	3,98	5.29	4.75	4.24	4.11	3.73	4.35	5.37	3.81	06.0	20.42	29.08	17.01	16.00	13.45	8.40	6,32
E	Massic Falls.		•	:	:	:	:	8,10	8.06	7.93	:	•	7.67	7.58	7.62	7.61	7.62	•	
EET AT	Old Belvidere Mill.		•	•	•	:	:	:	•	:	:	:	•	11.48	11.27	11.35	11 05	:	
Average Fall in Feet	Mill s'booV		:	:	:	:	:	21.92	21.70	22.13	:	:	24.27	23.81	24.34	23.95	24.11	:	:
E FAI	Stirling Mills.			•	:	•	:	22.60	22.37	23.19	•	•	24.84	24.51	24.83	24.60	24.78	:	
VERAG	Chase's Mill.			:	:	:	:	22.51	22.29	23.06	:	:	24.79	24.48	24.79	24.53	24.70	:	:
A	Faulkner's Mill.		•	:	:	:	•	22.72	22.54	23.26	•	•	24.85	24.54	24.88	24.03	24.79	:	:
Dam had ed, allow- or the di- to reach	Quantity that would have passed Vamest Dam had none been diverted, allowing three days for the diverted water to reach verted water to reach pam.		148.38	135.83	50.27	167.07	139.15	114.36	117.12	132.73	108.17	31.37	163.38	208.43	224.27	199.03	204.11	174.98	137.14
mined by	Quantity diverted from Sud- bury Miver by the City of Boston, as determined by the Engineer for the city.		. 9*1	7.6	5.0	14.2	8.2	0.6	5.7	4.5	7.3	18.4	4.6	2.1	0.5	•	0.5	14.3	3.9
CONCORD QUANTITY FLOW OF	Average during the day, 24 hours.	Cub. ft.	144.98	132.93	46.37	159.47	131.55	109.36	102.92	124.53	99.17	25.67	158,88	201.13	205.87	194.43	202.01	174.48	137.14
THE CONCORD THE QUANTITY THE FLOW OF	Average while the Mills were not running.	Cub. ft.	69.72	60.79	:	90.62	58.17	64.26	70.43	79.98	66.85	:	93.93	137.02	143.45	125.47	126.67	99.29	:
ED BY	Average while the Mills were running.	Cub. ft.	230.27	2:4.70	:	237.49	214.72	160.47	139.74	175.03	135.79	•	232,50	273.78	276.61	272.59	287.40	259.70	
TITY OF WATER FURNISHED BY ER AT WAMESIT DAM, BEING MASSIC FALLS DIMINISHED BY LES BROOK, 1876.	Day of the Month.		· •	6	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
WATE VAME FALLS OK. 18	A		"	"	"	"	"	"	"	3	3	"	"	3	;	"	3	*	
QUANTITY OF WATER FURNISHED BY INVER AT WANEST DAM, BEING AT MASSIC FALLS DIMINISHED BY HALE'S BROOK, 1876.	Day of the Week.		Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

CLEMENS, HERSCHEL, recalled.

Q. (By Mr. Butler.) You know the plan of the Wamesit

dam, do you not?

Mr. Shattuck. I object. The witness declined to answer any question in relation to that. I examined him very carefully about the length of the Wamesit dam, and he would not answer the question.

Mr. Butler. Pardon me; I am not going to ask him a question

about the length of it now.

Q. You know the plan of the Wamesit dam, — that it is a zigzag one?

A. I am familiar with the general shape of the Wamesit dam.

- Q. Now, assume that the dam, as made by the flash-boards, varies so as to be about $3\frac{3}{4}$ inches lower in the centre than at the ends, the flash-boards not being of uniform height, so that the lowest point is $3\frac{3}{4}$ inches lower than the highest, taking those two elements, I want to ask your opinion as an engineer, whether the measurements of water over such a dam, calculated by the formula for a straight weir, would be of any value in determining the quantity of water passing over it, and, if any, how much value?
- A. When I set out to measure the flow of Concord river, I talked this dam over with Mr. Davis —

Mr. Shattuck. That is not competent — what he did with Mr. Davis.

Mr. Butler. Yes: he went to work to make experiments upon that very question, to see if he could not measure the water running over Wamesit dam.

WITNESS. We separately and jointly -

Mr. Shattuck. I object to that; any consultation is clearly incompetent.

WITNESS. Well, I came to the conclusion, and I am of the

opinion now —

Commissioner Russell. Now you come to what is admissible. Witness. I came to the conclusion, and I am at present of the opinion, that a measurement taken on that dam would be unreliable: and as to its weight and what value it has, if any, I should say, compared with a measurement taken on a weir of proper construction, it has no value. It would have no weight compared with a measurement properly made. The dam is a zig-zag dam in shape; portions of it run almost fore and aft in the direction of the current, and, of course, on the line fore and aft with the trend of the current, it cannot act like a dam that is drawn across the current.

Q. That is, if I understand you, a portion of the dam runs almost in conformity with the current of the river?

A. There are zig-zags of various directions. There are all

sorts of zig-zags.

Q. Some of those zig-zags are nearly at right angles, are they not?

A. I think they are.

Q. So that it would bring a portion of the dam directly in accordance with the current of the river, at certain places?

A. Yes, sir.

Q. So that the water would have to turn before it goes over, and go over at right angles?

A. The dam always did leak when I knew it; I don't know how

tight it is at present.

- Q. Now, I will put the question directly which Brother Shattuck objected to. When you were called upon by the city to get the amount of water flowing this year in the Concord river, did you examine the dam, and go into it so far as to form an opinion whether it was possible to to make any accurate measurement over
- A. I did not go up again to examine it. I spoke of it from my knowledge of it.

Q. Wanting a place to measure the river, did you determine

that it could not be done there?

A. Yes, sir.

Cross-examination.

- Q. (By Mr. Shattuck.) Mr. Herschel, if Mr. Frizell, in his measurement, assumed that the same amount of water would run over this crooked dam that would run over a straight dam, and measured on that theory, his error would be, that he would estimate too much, wouldn't it? That is, he would get too much water, because it would run more slowly over a dam that is on the same line with the water-course, than it would over a dam that is across the water-course. Would not his error be that he would make too much?
 - A. Yes, sir; I should think it would.

Samuel N. Wood, recalled.

- Q. (By Mr. D. S. RICHARDSON.) You were not asked the question as to the size of your building, I believe?
 - A. I think not.

- Q. Will you state what you wish as to that?A. The building is two stories stone, and one story wood, with a slated roof, and it is 50×30 feet. Three stories, with a basement.
 - Q. Is that all you wish to state about the structure?

A. Yes, sir.

Cross-examination.

- Q. (By Mr. Butler.) Your two stories of stone come up to the railroad track on one side, and do not rise above the railroad track on the further side much?
 - A. No; it is a little above the railroad track.
 - Q. Just about level with the underpinning?

A. Oh, it is in the bank, you know. It is a stone building

Q. Oh, yes; it is a good building; that is not the point. One side of the stone part of the building is made by the bank?

A. Yes, sir; the one next to the bank is a solid wall, five feet

thick.

Q. And then the two stories in the rear?

 \hat{A} . Four feet thick, I think. It is a solid building for storage. That is for the elelevator.

Q. There is only one story of wood on the front side of the building, is there?

A. The whole length of the building.

Q. Above the bank on the upper side?

A. Yes, sir.

WHIPPLE TO PATCH.

Know all men by these Presents, That I, Oliver M. Whipple, of Lowell, County of Middlesex and Commonwealth of Massachusetts, in consideration of forty thousand dollars to me paid by Ephraim B. Patch, of Lowell aforesaid, the receipt whereof I do hereby acknowledge, do hereby give, grant, bargain, sell and convey unto said Patch the following-described parcels of land, situated in Lowell aforesaid, as follows: Beginning at the southeasterly corner of the premises, at the easterly side of a contemplated new street to be thirty feet wide; thence westerly across said contemplated street about thirty feet to the northeasterly corner of land of Lowell Bleachery Company, at a stone bound; thence westerly by said company's land to the southwesterly corner of a lot of land owned by S. N. Wood; thence northerly by said Wood's land about lifty feet to a stake at the northeasterly corner of said Wood's land; thence westerly by said passage-way or street to a stake at corner of Kewhall street, at a point which is about thirty feet northeasterly of the stone bound at the most northerly corner of land owned by said Lowell Bleachery Company; thence westerly about forty feet across Newhall street to a stake at the intersection of Newhall with Chambers street; thence westerly by the northerly side of Chambers street to land sold to Leland; thence northerly by said Leland's land about twenty-seven feet to land formerly of Kidder; thence north 82° 5′ east by said Kidder's land about eighty-eight feet, to a corner; thence north 84° and; thence south 88° 30′ east about three hundred fifty-three and 19-100 feet by land of Mathers and others, to the corner of a wall or fence; thence north 47° 15′ east by land of Mathers and direction across Crosby street to a wall at land formerly of Lyon about three hundred and fifty etc; thence north 44° east fifty-seven feet, to a street called Lyon street; thence in the same direction across said Lyon street, and to a to a wall; thence south 48° 20′ east by land of Davis and others one hundred and Know all men by these Presents, That I, Oliver M. Whipple, of Lowell, County of Middlesex and Commonwealth of Massachusetts, in consideration of forty thousand dollars to me by land of grantor about forty feet to an iron bolt in the ground ten feet easterly of the easterly rail of the railroad, and on the casterly side of aforc-mentioned contemplated new street; thence south 6½ west on the easterly side of last-named street by land of grantor two hundred thirty-one and 50-100 feet to the bound begun at. The following lots have been previously sold, and are reserved and excepted from this conveyance: A lot and ½ house, reviously sold, and are reserved and excepted from this conveyance: A lot and ½ house, reviously sold, and are reserved and excepted from this conveyance: A lot and ½ house, to John Higgins; a lot and house north side of Swift street, to Jeremiah Murphy; also one lot adjoining, to Bernard M'Laughlin; a lot and house at the southerly corner of Lawrence and Swift streets, to J. B. Brown; a lot adjoining, to Margaret Conners; also, adjoining last lot, Nos. 45, 46, 47, 48 and 49, to James Meadoweroft; also, on south side of same street, Nos. 41 and 42, to Sherman & Maynard; lots 25 and 26, Lawrence and north side of Watson streets, to George W. Norris; also, adjoining, lots 27, 28, 29, 30 and 31, to James Meadoweroft; also, lots No. 32 and 33, to E. B. Patch, and lots 34 and 35, to Sherman & Maynard, and No. 36, at the corner of Watson and Whipple streets, to Samuel Lawrence; also, lots 37, 38 and 39, fronting Whipple street, to Eliza Newhall; also, on the northerly side of Crosby street and corner of a new street out of the northerly side of Said Crosby street, to P. Donnelly, and a lot adjoining on Crosby street, to Michael Tully; also, lots 228, 220 and 230, on the southerly side of Crosby street, to Michael Tully; also, lots 228, 220 and 230, on the southerly side of Crosby street, and lots 135, 136, 137 and 138 on the west

side of Newhall street, to Eliza Newhall; also, on the westerly side of said new street leading from Crosby street, one lot each to John Keating, Ann Hoye and Rachel Kidder; also, a lot on the easterly side of same street, to John Keating; also, lot 102 to H. W. Millar, lot 100 to Chency & Huse, and No. 99 to Smith, all on the southerly side of Central street; also, lots sold to Joseph Tilton, on Central, Whipple and Chase streets. And the grantor, for the consideration aforesaid, grants and conveys unto the said grantee one other parcel of land lying between Lawrence street and Concord river, described as follows: Commencing at a stone bound at Lawrence street at the southwesterly corner of a lot of land sold by said grantor to Smith & Meadowcroft, in August, 1862; thence easterly and southerly and by various courses, by bounds at land of said Smith & Meadowcroft, Joshua Mather and A. H. Chase, to Concord river; thence southerly by said Concord river to the northerly side of the bridge leading over said river to Lowell Cemetery; thence northerly and by various courses by said bridge and Lawrence street to the bound begun at. Also, all the right, title and interest of the grantor in any streets north of River-meadow brook; also, all his right, title and interest in and to any land and water rights situated between the westerly side of said Concord river and land of said Smith & Meadowcroft, Mather and Chase. Also, one other parcel of land, situated on the easterly side of Concord river, bounded and described as follows: Commencing at the northerly side of the county road or street leading from Concord river by Lowell Cemetery, at a wall at the westerly side of said cemetry land; thence northerly by said wall to land sold by grantor to Josiah Gates; thence westerly by said described in said Gates' deed, about nine hundred and twenty-two feet, to a stake at the corner of said Gates' land, and at land of grantor; thence casterly by land of said Gates by a fence and wall to land of heirs of Zadoc Rogers; thence nor street, to the point begun at. Reserving in said fast parcel forty feet in width along the westerly line of said cemetery land to land of said Gates, as a common way or street for the use
of the abuttors thereon, and their heirs and assigns forever. Also reserving to the grantor,
and his heirs and assigns, the right to maintain a pipe across conveyed premises, now used
for conducting water from a spring to premises now occupied by said grantor. And
the grantor, for consideration before named, conveys to said grantee all his unsold waterpower, water-rights and privileges on Concord river, with all his rights to maintain the
present dam across said river at its present height, with his right to use the eight-inch flashboards thereon, as heretofore used; with all his rights of flowage, wherever situated, and
however obtained; and all rights of grantor to discharge water into River-meadow Brook.
And the grantor also conveys to said grantee, and his heirs and assigns, the right to collect,
for the purpose of renairing said dam and canal, all money due, and becoming due, from the for the purpose of repairing said dam and canal, all money due, and becoming due, from the former grantees of said Whipple, and their heirs and assigns, of water-power and rights for the maintenance of said permanent dam and banks of canal on conveyed premises. Also the the maintenance of said permanent dam and banks of canal on conveyed premises. Also the right to restrict said former grantees, their heirs and assigns severally, to the quantity of water purchased of said Whipple by them. And this deed is made, subject to former grants of water-power and water-rights, and rights of way to Smith & Meadoweroft, Joshua Mather, Charles Stott, Lowell Bleachery, S. N. Wood and A. H. Chase, and subject to the provision that the said grantee, and his heirs and assigns, shall forever maintain said permanent dam, and when needed, use the eight-inch flash-boards thereon, as he may have a right to do, and forever maintain and keep in repair the banks of the said canal which furnishes water to said other grantees of said Whipple; and shall so enlarge said canal, when needed, that it shall be of sufficient capacity to carry and discharge not less than two hundred and eighty-eight cubic feet of water per second, of eleven hours per day, of six days in the week. Also subject to rights of way, and in any rights of streets hitherto granted by said Whipple. And the grantor, for consideration before named, hereby conveys to said grantee a certain other parcel of land, situated in said Lowell, containing thirteen thousand and fifty-seven square feet, bounded as follows: Beginnung at Wamesit street, at the northeasterly corner of a lot of land conveyed by Robert Taylor to the City of Lowell, and at the southeasterly square feet, bounded as follows: Beginning at Wamesit street, at the northeasterly corner of a lot of land conveyed by Robert Taylor to the City of Lowell, and at the southeasterly corner of a lot formerly of Curtis Morse; thence southeasterly on the southeasterly on the southeasterly on a lot formerly of Curtis Morse; thence southeasterly on a curve about ten feet to a certain street or way opened by said Taylor and Elisha Davis; thence westerly on said street or way two hundred thirty-three and a half feet to the westerly corner of a lot of land conveyed by said Taylor to the City of Lowell; thence easterly at an angle of 86° 50′ on the line of said lot forty-seven and 8-10 feet; thence easterly at an angle of 169° 24′ to Wamesit street, and meeting the same at an angle of 78° at the point of beginning fifty-five feet and 92-100. To have and to hold all said conveyed premises, with the privileges and appurtenances thereto belonging, to the said Ephraim B. Patch, his heirs and assigns, to their use and behoof forever. And I do covenant with said Putch, and his heirs and assigns, that I am lawfully seized in fee of the premises; that they are free of all incumbrances; that I have good right to sell and convey the same to the said Patch, to hold as aforesaid; and that I will, and my heirs, exceutors and administrators shall warrant and defend the same to the said Patch, his heirs and assigns forever, against the lawful claims and demands of all persons. demands of all persons.

demands of all persons.

In witness whereof, we, the said Oliver M. Whipple and Sarah K. Whipple, his wife, in token of her release of all claim of dower in said premises, and who for the aforesaid consideration, and in consideration of one dollar, to her paid by said Patch, joins herein and releases and conveys with said Whipple to said Patch, his heris and assigns, all right and title to, and of homestead exemption in, the premises herein described, as aforesaid, have hereto set our bands and seals this twentieth day of March, in the year eighteen hundred and sixty-three.

SARAH K. WHIPPLE (SEAL).

Commonwealth of Massachusetts. Middlesex, ss. March 20, 1863. Then personally appeared Oliver M. Whipple and acknowledged the above instrument by him subscribed, to be his free act and deed. Before me,

DANIEL S. RICHARDSON, Just. Peace.

(Two twenty-dollar, one ten-dollar, and two five-dollar U. S. Rev. Stamps.)

Middlesex, ss. North District. Recorded March 21, 1863.

A. B. WRIGHT, Register.

Middlesex, ss. North District Registry of Deeds, Nov. 4, 1876. I hereby certify the above to be a true copy of the record of deed recorded in Book 34, page 140.

J. P. THOMPSON, Rear.

DEED. PATCH TO BUTLER.

Know all Men by these Presents, That I, Ephraim B. Patch, of Lowell, in the County of Middlesex and Commonwealth of Massachusetts, in consideration of (\$40,000) forty thousand dollars, to me paid by Benj. F. Butler, of said Lowell, Esquire, the receipt whereof is hereby acknowledged, do by these presents remise, release, bargain, sell and convey unto the said Butler, his heirs and assigns, all the land, real estate, water-power, water-privilege, property-rights, privileges and easements which were conveyed and granted to me, the said Patch, by deeds to me from Oliver M. Whipple, except such parts thereof as I have conveyed and granted away, the part or parts thereof remaining, and not conveyed or granted away, and hereby sold, conveyed and granted, being as follows, and all in said Lowell: A certain piece of land, situate in said Lowell, and bounded and described as follows, to wit: Beginning at a stone bound on the easterly side of Lawrence street at the southwesterly corner of land conveyed by said Whipple to the American Bolt Company; and thence easterly by land of said Bolt Company, and land conveyed by said Whipple and myself to A. H. Chase; thence turning southerly, and by the edge of the outer wall of the canal along said Chase's land to the southwesterly corner thereof; thence to the northwesterly corner of land sold and conveyed by me to L. W. Faulkner; thence southerly along said Faulkner's land to the southwesterly corner thereof; thence at nearly a right angle easterly by said Faulkner's land to Concord river; thence southerly by said river along the westerly bank thereof to the northerly by and along said Lawrence street along the easterly side thereof northerly by various courses to land conveyed by me to one Howarth; thence by said Howarth's land north (32!?) thirty-two degrees and a quarter degrees west by said Howarth's land sixty-four and 55-100 (64-55-100) feet to land of said Faulkner; thence north (33!?) thirty-three and a quarter degrees west by said Howarth's land sixty-four and 55-100 (6 Know all Men by these Presents, That I, Ephraim B. Patch, of Lowell, in the County of to said Chase's land, said street, including the bridge over the canal, to be maintained by the grantee thereof, his heirs and assigns, in accordance with the deed of O. M. Whipple to said Chase.

Chase.

Also another parcel of land situate in said Lowell, on the easterly side of Concord river, bounded and described as follows, to wit: Beginning at the northerly side of the county road or street leading from Concord river, by Lowell cemetery, at a wall at the westerly side of said cemetery land, and thence northerly by said wall to land conveyed by O. M. Whipple to Josiah Gates; thence westerly by said Gates' land twenty-eight (28) feet to a stake; thence northerly, by the easterly side of a passageway, by stakes at different angles, described in said Gates' deed about (922) nine hundred and twenty-two feet to a stake at the corner of said Gates' land; thence easterly by land of said Gates, by a fence and wall, to land of heirs of Zadoc Rogers; thence northerly by said heirs' land on a wall to a corner; thence westerly by said heirs' land on a wall to a corner; thence westerly by said heirs' land to a corner; thence westerly by

Gatoe' land; thence easterly by land of said Gates, by a fence and wall, to land of heirs of Zadoe Rogers; thence northerly by said heirs' land to a corner; thence westerly by said heirs' land to a corner; thence northerly, partly on a wall, and by the course of said wall to a bound at said heirs' land; thence westerly by said heirs' land to Concord river, at a point nearly opposite the mouth of River-meadow Brook; thence southerly by Concord river to the northerly side of the said bridge leading over said river to Lowell cemetery; thence easterly by the northerly side of said bridge and a county road or street to the point of beginning. Reserving a right of way over forty feet in width along the westerly line of said county road to land of said Gates as a way or street for the use of the abuttors thereon, and their heirs and assigns forever. And also reserving to O. M. Whipple, his heirs and assigns, the right to maintain a pipe across said premises, as now used for conducting water from a spring to premises now occupied by said Whipple.

Also another piece of land situate in said Lowell, and bounded and described as follows, to wit: Beginning at the westerly side of Lawrence street, at the southeasterly corner of land conveyed by O. M. Whipple to Charles Stott, and thence northeasterly by said Stott land by and along Lawrence street, across River-meadow brook to the southeast corner of land conveyed by me (the said Patch) to Artenus Bedlow; thence southwesterly by said Bedlow land-to the southwesterly corner thereof; thence turning at nearly a right angle with the last line, and running northeasterly by lands of said Bedlow and of Bernard Riley and Churchill (200) two hundred feet to Watson street; thence southwesterly by said Watson street to Whipple street; thence at an angle southwesterly by said Watson street to Whipple street; thence at an angle southwesterly with said Whipple street; and running westerly by land of said Devine, Elisha Hall, land of myself, and land sold by me and conveyed by Watson Said

thence southeasterly by the line of land of said Bleachery to a stone bound at the westerly side of a contemplated street (designated to run from Moore street to Lawrence street) said bound being at the southeasterly corner of said Bleachery's land; thence southeasterly, in continuation of the last line, across said new street to a fence at land of 0. M. Whipple; thence northerly by said Whipple's land to a corner of the fence; thence easterly by said thence northerly by said Whipple's land to a corner of the fence; thence easterly by said fence to Lawrence street; thence northeasterly by said Lawrence street to point of beginning. Reserving and excepting from the said last-described piece of land a certain piece or parcel of land conveyed by O. M Whipple to Charles Stott by deed, dated Also reserving and excepting one other piece or parcel of land, conveyed by said Whipple to Samuel N. Wood by deed, dated with all the rights and privileges conveyed to the said Stott and Wood in said deeds, and reserving and excepting the right of way in all the streets named in the description of the piece of land last above-described, to be forever kept of the said Stott and Wood in said deeds, and reserving and excepting the right of way in all the streets named in the description of the piece of land last above-described, to be forever kept orgen.

kept open.

the streets named in the description of the piece of land last above-described, to be forever kept open.

Also, another parcel of land, situate in said Lowell, and bounded and described as follows, to wit: Beginning at the easterly side of Chambers street, at the southwesterly corner of land of one Leland, and thence northeasterly by said Leland's land to land formerly of one Kidder; thence south (28½) twenty-eight and a half degrees east by said Kidder and about (88) eighty-eight feet to a corner; thence north (8½) eight and three-fourths degrees west about (118½) one hundred and eighteen and a half feet to a corner of a wall at land formerly of said Kidder and land of Joshua Mather; thence south (88½) eighty-eight and a half degrees east about (350) three hundred and fifty feet by land now or formerly of said Mather and others to a corner of a wall or fence; thence north (45½) forty-five and a quarter degrees east by a wall or fence about (186) one hundred and eighty-six feet to Crosby street; thence southerly by Crosby street about (250) two hundred and eighty-six feet to Crosby street (a new street laid down on a plan on record in the Registry of Deeds at Lowell aforesaid, the date of which record is the (1st) first day of September, in the year (1864) eighteen hundred and sixty-four; thence at about a right angle with said Crosby street westerly, and by the northerly line of Kinsman street about (374) three hundred and seventy-four feet to Chambers street; thence northerly by the easterly side of Chambers street to the point of beginning. Reserving and excepting the right of way over Prospect, Pine and Kinsman streets, to be laid out in accordance with said plan. Said parcel of land being lots Nos. (80) eighty-six, (87) eighty-seven, (88) eighty-eight, (89) eighty-nine, (90) ninety, (91) ninety-one, (92) ninety-three, (94) ninety-three, (94) ninety-wise, (97) ninety-seven, (98) ninety-eight, (99) ninety-nine, (100) one hundred, (101) one hundred and four, (105) one hundred and eight, (109) one hundred and

Also another parcel of land situate in said Lowell, and bounded and described as follows, to wit: Beginning at the southwest corner of the premises at the corner of Swift and Whip-ple streets, and thence northerly by Whipple street about two hundred and eighty-four feet to a stone bound at land conveyed to James Meadoweroft; thence at a right angle easterly by said Meadowcroft land about two hundred and sixty-one and a quarter feet to a stone bound at land of heirs to P. O. Richmond; thence by said heirs' land about ninety feet to a stone said Meadowcroft land about two hundred and sixty-one and a quarter feet to a stone bound at land of heirs to P. O. Richmond; thence by said heirs' land about rinety feet to a stone bound; thence southerly about one hundred and seventy-seven feet to a wall; thence south, eighty-six degrees west, by land conveyed by me to one McLaughlin, about eighty-five feet to Chase street; thence southerly by Chase street about one hundred and seven feet to Swift street; thence westerly and across Chase street about one hundred and fifty feet to point of beginning. Reserving and excepting the right of way over Chase street to be laid out in accordance with said plan said parcel of land being lots 151 to 162 inclusive, on said plan, excepting lot 157 on said plan. Also another parcel of land situate in said Lowell on the westerly side of Whipple street, and bounded and described as follows, to wit: Beginning at a stone bound at land of W. H. Parker, and thence northwesterly by said Parker land about three hundred and fifty feet to land eonveyed by O. M. Whipple to me Miller; thence easterly by said Miller land, land of owner unknown, and land of Cheney and Hews, and of P. Smith about one hundred and ninety feet to Whipple street; thence southerly by Whipple street; hence westerly by northerly side of Kinsman street about twenty-three and eight-tenths feet to point of beginning, being lots Nos. 136 to 145 inclusive, on said plan.

Also another parcel of land situate in said Lowell, on the southerly side of Kinsman street, and bounded and described as follows, to wit: Beginning at a stone bound at the northeasterly corner of land conveyed by me to one Gray, and thence westerly by a new street laid down on said plan, called Kinsman street, about two hundred and fifty-four feet to land conveyed by O. M. Whipple to one Keating; thence southeasterly by said Keating land to a stake; thence northwesterly about two feet to a line of the street; whence southeasterly by said Keating land to a stake; thence northwesterly about two feet t

land about nine feet to a stake; thence westerly about thirty feet by said Keating land to a stake; thence northwesterly about two feet to a line of the street; thence southwesterly by said Kinsman street about eighty feet to Crosby street; thence southwesterly by street about sixty-eight feet to a passageway twelve feet wide, forever to be kept open; thence easterly by said passageway about three hundred and seventy feet to a stone bound at the southwest corner of said Gray land; thence by said Gray land northerly about ninety feet to the point of beginning, being lots Nos. 111 to 125 inclusive, on said plan. Also the following mentioned lots of land as laid down on said plan, and in said Lowell, to wit: Lots numbered fifty-seven (57), fifty-eight (58), fifty-nine (59) on Newhall and Chambers streets. Lots numbered seventy-two (72), seventy-three (73), seventy-four (74), seventy-five (75), seventy-six (76), and seventy-seven (77) on Chambers street, between Kinsman and Newhall street. Also lots numbered one hundred and seventy-one (171), one hundred and seventy-two (172), one hundred and seventy-one (171), one hundred and seventy-three (173) on the southerly side of Swift street.

Also, all personal property belonging to or owned by said Patch, or npon or about the afore-mentioned or afore-described premises, used, had, or owned in connection therewith,

afore-mentioned or afore-described premises, used, had, or owned in connection therewith, except hunber other than that intended for the repairs of wheel, and the wood cut and lying on the premises; also excepting the machinery and material used in the oke mannfacture other than the main shafting and pulleys thereon in the brick mill. This conveyance is made subject to each and every street and passage-way laid down on the registered plan beforenamed, and each and every street and passage-way herein named not on said plan, to be forever left open for the free travel of the abuttors thereon, and their heirs and assigns; and also subject to any and all rights of way heretofore granted by said O. M. Whipple or by me, the said Patch; also subject to all rights of grantees, their heirs and assigns, claiming by, through, or under said O. M. Whipple, and named in the deed from said Whipple to me of the property herein described, and all rights of grantees, their heirs and assigns, claiming by, through, or under me, the said Patch, but not including in such rights of said grantees of said Whipple, or of said grantees of myself, the fee of any of the land or real estate hereinbefore particularly described and conveyed, and other than what is hereinbefore excepted or reserved; also subject to all rights of the American Bolt Company, Kimball & Hooke, George Naylor and C. H. Crowther, tenants under written leases, during the terms of the said leases respectively. And the grantor, the said Patch, excepts and reserves all buildings, structures and machinery And the grantor, the said Patch, excepts and reserves all buildings, structures and machinery not the property of him, the said Patch, and the right of the owners thereof, to use the same during the continuance of the terms of their leases respectively, and to enter and remove the

during the continuance of the terms of their leases respectively, and to enter and remove the same as provided therein.

And I, the said Patch, for the consideration before named, remise, release, bargain, sell, and convey unto the said Butler, the grantee, his heirs and assigns, all my, the said Patch's, unsold water power, water rights and privileges in or on Concord river, and as led, conducted and taken from or out of Concord river, with all my rights to maintain the present dam across said river at the height of the present dam, with all my rights to use the eight-inch flash-boards thereon, with all my rights of flowage, wherever situated and however obtained, and all my right to discharge water into River-meadow brook, and also all my right to collect, for the purpose of repairing said dam and canal, all money hereafter, coming or becoming due from the former grantees of said Whipple, their heirs and assigns, and the grantees of myself, the said Patch, their heirs and assigns, of water power and rights for the maintenance of said permanent dam and banks of canal on the premises hereby conveyed, and also the right to restrict said former grantees of said Whipple and myself, their heirs and assigns respectively, to the quantity of water purchased by said grantees respectively, to the quantity of water purchased by said grantees respecthe maintenance of said permanent dam and banks of canal on the premises hereby conveyed, and also the right to restrict said former grantees of said Whipple and myself, their heirs and assigns respectively, to the quantity of water purchased by said grantees respectively of said Whipple and of myself, the said Patch. And this deed is made subject to former grants of water power, water rights and rights of way to Smith & Meadowcroft and American Bolt Company, Joshua Mather, Charles Stott, Lowell Bleachery, Samuel N. Wood, A. H. Chase, Hosford & Chase, and L. W. Faulkner, and subject to the provisions in the deed of said Whipple to me; and also subject to the liability, duty, and obligation hereby created and assented to and assumed by the grantee in and of this deed, that the said grantee, his heirs and assigns, shall forever maintain said permanent dam, and, when, needed use eight-inch flash-boards thereon, as the said grantee and his heirs and assigns have a right to do, and forever maintain and keep in repair, the banks of a canal to furnish water to the said former grantees of said Whipple and said Patch, their heirs and assigns, and shall so enlarge said canal when needed, that it shall be of sufficient capacity to carry and discharge not less than two hundred and eighty-eight cubic feet of water per second of eleven and one-quarter hours per day of six days in each week, and shall also keep, perform and fulfil all the obligations of supplying water, and all other obligations and covenants to be kept, performed and fulfilled by the said Patch and said Whipple and their heirs in any and all grants and deeds hitherto made by said Patch and said Whipple and their heirs in any and all grants and deeds hitherto made by said Patch and said Whipple, of land and water power and privilledges in connection with said canal, to any person or persons, or corporation or corporations; and, in case of failure of the grantee, his heirs or assigns, to perform and fulfil said liability, duty, and obligation as aforesaid, whe

paid. The said Patch, the grantor, for the consideration aforesaid, hereby remises, releases, bargains, sells, and conveys, and intending to remise, release, bargain, sell, and convey to said Butler, the grantee, all, each, and every parcel of or tract of land, water right, easement, appurtenance, property, right of property, and interest whatever obtained, received, accruing or resulting to said Patch, by, through, or under any deed from said Whipple to accruing or resulting to said Patch, by, through, or under any deed from said Whipple to said Patch, and the covenants, agreements, warranties, and guarantees therein and thereof (excepting such lands, right of water, and casements and property hereinbefore described as have heretofore been duly and legally conveyed and granted by said Patch, by his deeds and leases heretofore made and recorded, also excepting such personal property as has been heretofore sold and removed, and except lots Nos. 40 and 41, sold to one Hall, and lots Nos. 60 and 61 sold Mrs. Cain, and lots Nos. 131 and 132 sold to one Stanton, which deeds are held in my hand and not recorded, and also the lots conveyed by said Patch to one Mrs. Keating and Patrick Donnelly, whether said lands, casements, appurtenances (property, rights of property, interest and claims) are or have been heretofore set forth, described, bounded, or declared in this deed, or however the same may be otherwise bounded and described.

described.

To have and to hold the same, and every of the above-named premises to said Butler, To have and to hold the same, and every of the above-named premises to said Butler, grantee, and his heirs and assigns forever. And I, the said Patch, do avouch myself the true and lawful owner of the aforegranted premises; that they are free of all encumbrances or claims made or suffered by said Patch not herein set forth; and that I will, and my heirs, shall warrant and defend the same, and every of them, to said Butler, grantee, his heirs and assigns, forever against the lawful claims of all persons claiming by, through, or under me, the grantor, except a mortgage to Oliver M. Whipple, which said Butler assumes to pay and hold the grantor personally discharged thereof.

In witness whereof, I, the said Ephraim B. Patch, being now sole and unmarried, have hercunto set my hand and seal this fifteenth day of February, in the year of our Lord one thousand eight hundred and sixty.five.

thousand eight hundred and sixty-five.

E. B. PATCH (SEAL).

Signed, scaled and delivered in presence of us. (Sheets 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 and 19). GEORGE F. RICHARDSON.

Commonwealth of Massachusetts. Middlesex, ss. February 15th, 1865. Then the aforenamed Ephraim B. Patch personally appeared and acknowledged the foregoing instrument to be his free act and deed. Before me, GEORGE F. RICHARDSON, Justice of the Peace.

(Forty dollars, U. S. Rev. Stamps, cancelled).

Middlesex, ss. North District. Recorded Feb. 15, 1865.

A. B. WRIGHT, Register.

Middlesex, ss. North District. I hereby certify the within to be a true copy of the record of deed recorded in Book 41, page 56, M. N. District Registry, Nov. 4, 1876.

Attest:

J. P. THOMPSON, Rear.

BENJAMIN F. BUTLER TO WAMESIT POWER COMPANY.

Know all men by these Presents, That I, Benjamin F. Butler, of Lowell, in the County of Middlesex, and Commonwealth of Massachusetts, Esquire, in consideration of seventy thousand dollars, to me paid by the Wamesit Power Company, the receipt whereof is hereby acknowledged, do hereby give, grant and convey, remise, release, and for land, water-rights, easements, appurtenances, property, rights of property and interests which I purchased of Ephraim B. Patch, and which he conveyed to me by his deed, dated February 15th, 1865, and recorded in North Middlesex Records, Book 41, pages from 56 to 67 inclusive, to which deed, reference is to be had for a more particular description.

Excepting a certain piece or parcel of land conveyed by me to John Kirwin by my deed, dated October 27th, 1865, and also another certain piece or parcel of land conveyed by me to L. W. Faulkner, by my deed dated November 15th, 1865.

To have and to hold the above-released premises, with all the privileges and appurtenances to the same belonging, to the said Wamesit Power Company and their successors to their use and behoof forever. Know all men by these Presents, That I, Benjamin F. Butler, of Lowell, in the County

use and behoof forever.

And I, the said Benjamin F. Butler, for myself and my heirs, executors and administrators do covenant with the said Wamcsit Power Company and their successors, that the premises are free from all incumbrances, made or suffered by me.

And that I will, and my heirs, executors and administrators shall warrant and defend the same to the said Wamesit Power Company, and their successors forever, against the lawful claims and demands of all persons, claiming by, through, or under me, but against none other.

In witness whereof, we the said Benjamin F. Butler and Sarah Butler, wife of said Benjamin, in token of her release of all right and title of or to both dower and homestead in the granted premises, have hereunto set our hands and seals this tenth day of February, in the year of our Lord eighteen hundred and sixty-six.

BENJ. F. BUTLER. [SEAL.] SARAH BUTLER. [SEAL.]

Signed, sealed and delivered in presence of

HENRY H. BENNETT. ZACH B. BROOKE.

DISTRICT OF COLUMBIA, CITY AND COUNTY OF WASHINGTON.

Be it remembered that on this tenth (10th) day of February, in the year one thousand eight hundred and sixty-six, before me the undersigned a commissioner, resident in the City of Washington, in said district, duly commissioned and qualified by the executive authority, and under the laws of the State of Massachusetts, to take the acknowledgments of deeds, etc., to be used and recorded therein personally appeared Benjamin F. Butter and Sarah Butter his wife, to me known to be the individuals named in, and who executed the foregoing conveyance, and severally acknowledged the same to be their free act and deed before me.

In witness whereof I have beginned set my hand and affixed my official seal the day and

In witness whercof, I have hercunto set my hand and affixed my official seal the day and

year aforesaid.

ZACH B. BROOKE,

Commissioner for Massachusetts in the District of Columbia.

COMMONWEALTH OF MASSACHUSETTS.

LOWELL, Feb. 28, 1866. Recorded in the Registry of Deeds for the Northern District of Middlesex, in Book 47, page 128. A. B. WRIGHT, Reg.

CLOSING ARGUMENT FOR THE RESPONDENTS, BY LINUS M. CHILD, Esq.

Mr. Chairman and Gentlemen: — In the remarks that I shall make to you on this matter, I shall not attempt to go into any minute examination of the evidence, or to make any extended argument on the general principles involved. The matter has been already so many times and so fully argued, that it would be presumption in me to attempt to add anything to what has been said on the principles of law applying to all the cases which have been before the commissioners; but I must ask your Honors, in the consideration of this matter, to remember what has been stated perhaps before, and that is what the City of Boston is authorized to do, and what the City of Boston has done.

In the first place, the City of Boston has been authorized, by act of the legislature, to take the Sudbury river for the purpose of supplying pure water to the City of Boston; and under that act, the city has seized, as required by the act, by filing in the Registry of Deeds for Middlesex County a description of what they have taken; and by that paper filing it appears that the City of Boston have the whole of Sudbury river. Then, the city being authorized to take the Sudbury river for the purpose of supplying the city with water, and having taken it, as appears by the paper filed, they have the whole of Sudbury river. That we admit. There are, however, certain restrictions in regard to the taking of the water of Sudbury river which must be considered by this commission, and which must be allowed for, in the estimation of the damages. They are the restrictions imposed by nature and the character of the property taken. We claim, therefore, that, while technically the whole river has been taken, still the fact that no river can by any possibility be taken away entirely must be considered; that as there are certain seasons of the year when the river must overflow any dam that can be made, it must run in its accustomed channel, no matter what obstructions are placed therein, no matter what act is done by the city to take it away. Therefore we claim that the Sudbury river does furnish to the Concord river a certain proportion of the water, at certain times of the year, notwithstanding any diversion by the City of Bos-

Again: We claim that, in the consideration of this case, the

actual condition of things is to be considered. You have seen and have had evidence in regard to the manner in which it is proposed to take this river. By that testimony it appears that they propose to take it by certain dams which you have seen and have heard about, and with those dams a certain amount of the water of the Sudbury river must and does and will flow into its accustomed channel; therefore, when it is said that the whole of the Sudbury river has been taken by the City of Boston, it must be understood with those restrictions that I have indicated. I do not know that this theory has been opposed by any of the petitioners here, and I think I make a statement which will not be denied when I say that one-half of the time in each year the taking of the water of Sudbury river by the City of Boston will do no damage to the riparian proprietors upon the Sudbury or upon the Concord river. And, as an illustration of this, your Honors will remember that Mr. Fteley testified, and the profiles which he put in show, that there are times when the Sudbury river flows 3,200 cubic feet per second, and at such times, as he testified, and as it was not necessary for him to testify, for this commission would know it without, it would be simply impossible for the City of Boston, under any conceivable circumstances, to take all of that water into a conduit for the purpose of the act; that is, to supply the City of Boston with pure water. Therefore, we claim as the first proposition, that we have not taken the Sudbury river entirely and utterly, but that we have only taken a certain portion of it; that the outside claim which can be made by the petitioners is, that we have taken it for six months in the year, and even then it is not contended that it is continuously taken for six months in the year. Your Honors saw what a very large flow of water there was in the Sudbury on the 31st of July; so large that it could not be kept or controlled by any dam that has been built or could be built by the City of Boston. The outside claim, therefore, must be for six months in the year, subject to certain contingencies and variations, which must be considered and understood by the commissioners.

Then this water for the City of Boston (and I think that is a fair consideration) is to be taken by certain conduits, in a certain manner, and the mode of taking must be confined, and it must be presumed to be confined, to a reasonable extent, and for the purposes of this act; and therefore we can claim that there is a large amount of water in the Sudbury river, sufficient for all these petitioners during six months in the year, and a large amount during the other six months of

the year, that runs in its accustomed channel, and for the diversion of which we are not, therefore, called upon to pay.

The next proposition which I would present to the commission is, that, under the act, the City of Boston must pay for all damage that it does to any water-rights of any riparian proprietors, in any way, by the taking of Sudbury river. But this damage must be confined to the actual possible Not that I mean to say that it is to be confined to the amount of water that is being diverted to-day, but that it must be confined to the actual amount that it is possible to divert with the dams as built or being built upon the Sudbury river, and it must be for the diversion of the river from the parties petitioners under the rights and titles as proved. Now, as I understand the law, there can be no claim made for damages for the diversion of water, except by riparian proprietors, in the first instance; that the law provides that every riparian proprietor upon the banks of a river shall have all the water that is accustomed to flow in that river flow by his banks; that the riparian proprietor has a right to take the water out upon his own land and use it in any form that he sees fit, provided, if used for manufacturing purposes, that he returns it again into the stream before the stream leaves his land; and that, therefore, in the Wamesit dam cases, it is incumbent upon the petitioners to show first, that they have riparian rights, or, second, that they claim in some way by legal grant from some person who has riparian rights. I would ask your attention, therefore, in the first instance, to the title as put in and claimed by these petitioners. There is no one of them, I claim, that has any right to the water as a riparian proprietor. To be sure, there are two petitioners who border upon Concord river, but they border upon Concord river only upon one side. They have not taken out the water upon their land, nor have they delivered it again into the river upon their land; therefore, for the purposes of this case, every one of the petitioners upon the Wamesit dam are not here as riparian proprietors. If they cannot claim a right to the water under a riparian proprietor, we claim that they have no right to the water at all. I suppose that the only way in which they claim to have the water delivered to them, and therefore to have damages against us for diversion, is under the deed of Oliver M. Whipple, or Ephraim B. Patch, his grantee; and I claim one thing further, and that is, that, not claiming here as riparian proprietors, they can claim only under that deed, and that when the City of Boston takes this water by act of the legislature for a public purpose, and for a public benefit, they are restricted directly and exactly to the terms of their

grant, and cannot ask to have it enlarged by implication in any way. I ask the attention of the commission to one of the deeds, and I believe the form is the same in every deed. If it is not, it will be pointed out undoubtedly by those who come after me as regards their particular title. Any way, I shall not read any others. The one to which I call your attention, is the deed given by Oliver M. Whipple to Joshua Mather, under which the Sterling mills claim. The deed will be found on page 546 of the record. In the first place, I will call your attention, in confirmation of what I said before, to this clause in the deed: "Do hereby, give, grant, bargain, sell and convey unto the said Joshua Mather, a certain parcel of land situated in said Lowell, near the Concord river," - showing that they are not on the Concord river; and then, after describing the land, it says, at the bottom of the page: "Also, the right, privilege and easement to take water by means of the canal of the grantor lying southerly of the premises, and leading out of the Concord river, and by means of head raceways to enter the said canal at any point opposite the premises, and to conduct the water to the premises to be used thereon, the same to be done in such a manner as in no wise to injure or weaken the banks of said canal, or interrupt the flow of water therein." By this clause which I have read they are granted the right to take water by means of the canal leading into the Concord river, and to enter the canal opposite the premises. The next clause is: "Also, the right for said water to enter said canal from the said Concord river to the extent hereinafter specified, and the right forever hereafter to have said canal and the banks thereof, and the permanent dam owned by the grantor across Concord river, continued for the purpose of affording a water-power, and to the extent and with the exceptions and reservations hereinafter contained and set forth, the quantity of water which may be drawn from the canal by the grantee, his heirs and assigns, is strictly limited to, and shall not exceed thirty-six cubic feet per second for eleven and one-quarter hours per day of six days of the week; and if at any time the quantity of water in the canal shall not equal two hundred and eighty-eight cubic feet per second during the time aforesaid, then the grantee, his heirs and assigns, shall during such time be restricted to one-eighth of the quantity of the water in the canal; meaning that the quantity of water which may be drawn from the canal by the grantee, his heirs or assigns, shall never at any time exceed thirty-six cubic feet per second for the above-specified time, however great may be the supply of water from the said canal, and that the quantity of water which may be taken by

the grantee, his heirs and assigns, shall be restricted to such an amount less than thirty-six cubic feet per second during the above-specified time, as shall be equal to one-eighth of the supply afforded from the canal, whenever the water in the canal shall be less than two hundred and eighty-eight cubic feet per second for eleven and one-quarter hours per

day for six days of the week."

Now, in the first place, I call your attention to this,—that, if there is any riparian proprietor, it is Oliver M. Whipple; that he has made his canal, and that he has the right to run his canal as he has, and that he has granted to this petitioner, the Sterling mills, a right to not more than thirty-six feet; but it is restricted by this condition,—that, if there is not a certain amount of water in the canal, then he is not to have as much.

Mr. Shattuck. We do not claim anything beyond our

deed, as I understand it.

Mr. Child. I did not suppose you would; but what I claim is, that, under the deed, they have not got any right to have thirty-six cubic feet; that, if the City of Boston takes away half of the water in the Concord river, under that careful restriction, as the water was conveyed by Oliver M. Whipple, these grantees cannot say one word; because he never agreed that they should have all the water there is in the river, except as set forth in the deed. When the water in the canal is less than two hundred and eighty-eight feet, they are to have only their aliquot part. Now, our claim is, no matter what the City of Boston have taken away, they have taken it away from the riparian proprietor; that that riparian proprietor is Oliver M. Whipple and his grantees; and that these parties cannot claim because they are not the grantees of any exact right in this water, but simply a certain portion of the water that may be in the canal.

Mr. D. S. RICHARDSON. Do you mean to say that the riparian proprietor, Mr. Whipple, had a right to sell the water, before it came down this canal, to everybody else,

although he had granted this right to these persons?

Mr. Child. I mean to say, that Oliver M. Whipple did not sell any of these grantees any particular amount of water; that he sold them an aliquot part of any water which might be in the canal which he made; and that he did not undertake to say that that canal should do anything except have a certain capacity.

Mr. Storey. Do you claim that he could have built a canal on the other side of the river, and diverted the water

away from us?

Mr. Child. So far as this title is concerned, he might perhaps have built another canal on the other side of the river, and taken the water out and granted it to anybody he chose, and he could not have been legally prevented by this conveyance.

Mr. RICHARDSON. Did you read all of the clauses in the

deed?

Mr. Child. I have not read the whole of the deed. I will leave it for you to read, if you see fit.

Mr. Richardson. There is a clause that conveys not only

the water, but the right.

Mr. Child. I have read that: that he has a right by this canal to enter Concord river; that he has a right to draw from Concord river the water by means of this canal; but he does not say that he shall have any more than one-eighth part of the water in the canal; and in this case he is not bound to furnish it.

Mr. Storey. [Reading.] "Also the right of said water to enter said canal from the said Concord river to the extent

hereinafter specified."

Mr. Child. Yes, sir: "to the extent hereinafter specified;" and "the extent hereinafter specified" is, that he shall have one-eighth of all the water there is in the canal. Of course I do not mean to say that he would have any right to change his head-gates, or to make any change in the manner of the delivery of the water from Concord river into the canal. But, for the purposes of this case, I do not think it is necessary that the commission should hold with me on this point; and I would admit, for the purposes of this case, that if Mr. Whipple had conveyed ALL the water in the Concord river under just such deeds as this, he might be prevented from conveying the water to anybody else, or that he might be prevented from in any way disturbing the water of Concord river, and preventing it from flowing - the whole of it into this canal. But I do ask your Honors' attention to this point, and that is, that Mr. Whipple and his grantee, the Wamesit Power Company, owned the banks and owned the dam. He was the riparian proprietor, and as such riparian proprietor he makes these agreements to furnish power to the parties upon his canal. In other words, he stands in precisely the same position as the Essex Company, in Lawrence; and that is, the Essex Company has been presented to you here owning the power; they built their canals, and furnish it to various parties that may buy land of them, in exactly this way, upon their canal, and then the Essex Company comes here and asks for damages for this taking of the water. Now, then, if the proposition in that case is sustained,—that the Essex Company has the right,—then of course they alone have a right to ask for damages, and no one of their grantees has the right to come in and ask for damages.

Mr. Shattuck. They have not sold the water to an

amount where they can possibly be affected.

Mr. CHILD. They claim to be affected to the extent of \$150,000. But the Essex Company is furnishing power there to the riparian proprietors. They are the owners and the only owners, who can ask for damages, and their grantees, not being situated upon the river, and not being riparian proprietors, have no right to come in and petition for damages from the City of Boston. And therefore, for precisely the same reason, the grantees of Oliver M. Whipple or of the Wamesit Power Company have no right to come in here and ask for damages. It is only the riparian proprietor who can ask for damages; he is to furnish water to his grantees, as he has agreed in his title; and if he does not, then he is to be liable therefor. And I claim, right here, that the rights granted here by this grantor, are of such a character, that they cannot be said to have an interest carved out of that estate for which they can claim damages, and that they are not to be considered in the same condition as a lessee for years in a piece of real estate; but that their right is such, by the terms of the deed, that they cannot come here under this act of the legislature and petition for damages.

Now, I desire to carry this matter one step further. will remember, and it has appeared here, that the capacity and the purpose of that canal, so far as these petitioners are concerned, is to carry 288 cubic feet per second; that the grantor (put it as strong as you please) has guaranteed to the owners of these mills upon his canal, that they shall have the amount of water that he has conveyed to them; and this riparian proprietor has conveyed away 220 cubic feet of water; the capacity of the canal, if you construe it in that way, is 288 cubic feet per second. He has agreed to furnish to his grantees, as has been testified here, 220 cubic feet, and he has reserved to himself 68 cubic feet. Now, can any one of these petitioners claim from their grantor, or through that grantor from anybody else, any more than 220 cubic feet of water in that canal? If they cannot, then the riparian proprietor owns the water, and has a right to have the water of Concord river flow in its accustomed channel, and for his use, subject to the grants which he has made, which in this instance amount to 220 cubic feet per second, out of his canal. Therefore, if the City of Boston should take less than 68 cubic feet from the river and prevent it from flowing into

that canal, he is the only person that has any right to claim any damages as the riparian proprietor, and these parties cannot come and claim any damages for the taking of water unless they can show that the water taken is so much that it is impossible that they should receive from

their grantor the amount which he granted to them.

I would admit, for the purposes of this case, that if the grantor had sold all his water, and then the City of Boston took any portion of it away, these petitioners would have a right to come and ask for damages; but the grantor having reserved out of his water 68 cubic feet, and the defendants here having taken less than 68 feet — for nobody has claimed as yet that the Sudbury river was more than one-fifth of the Concord, and that would leave —

Mr. Richardson. Oh, yes, sir; there are two ways by

which it is shown.

Mr. Child. I say (and I think the evidence will bear me out in it), that nobody has yet claimed that the Sudbury river contributed to the Concord river more than one-fifth in flow; and if you take out of the 288 feet one-fifth, you leave 224 cubic feet for the water in that canal. And even if you put it one-fourth, still, for the purposes of this argument, it makes no difference with the result; that is, there will be in that canal 220 cubic feet of water, which is all that any of the petitioners can ask for. But I ask the attention of the commission to this one thing, right here, and that is, there has been no proof introduced here that Mr. Oliver M. Whipple was a riparian proprietor of any sort. There has not been one particle of evidence brought here to show that the grantor under which these parties claim, was a riparian proprietor; and, unless he was a riparian proprietor, I claim that they can have no case here whatever; that they must show, either that they themselves are riparian proprietors, or that they claim under a riparian proprietor. They have introduced no evidence as to the title of Oliver M. Whipple, or any of his grantees; they have introduced no evidence as to the ownership of the land on the other side of the river, and therefore we claim that they cannot, in that state of the evidence ask for any damages; for although the deed recites that he has the right to convey certain water, still it does not appear that he was a riparian proprietor at all, or, if he was on the side where this canal is, that he was not upon the other side of the river, and unless he can establish a title to the land on the other side of the river, from the place where the dam is built to the place where the water is returned again by means of the raceway into the river,

then of course he has not a complete title, and has only one-half of the water.

Mr. D. S. RICHARDSON. Do you mean to say that, when you have proved yourselves that he had forty-five years' possession of that dam and maintained it?

Mr. Child. I do not know that we have said anything of that sort, and certainly there is no evidence of that sort.

Mr. RICHARDSON. We brought a witness who said he knew that Mr. Whipple built that dam forty-five years ago, and that he had maintained it ever since.

Mr. CHILD. That he built and maintained that dam is of no consequence, unless he was a riparian proprietor above the dam, and below the raceway. The point I make is this: that, in order to claim an exclusive right to the use of any water, a man must be shown to be a riparian proprietor from above the dam to below the raceway, on both sides of the stream, because he would have to maintain the dam; non constat, that he would not be subject to reservations and rights on the other side of the river, and subject to various rights; and I claim that it must be shown that he is a riparian proprietor before they can make any claim. But whether he is a riparian proprietor below, with sufficient right to take all this water or not, still I claim that he has granted out of it only 220 feet, and, as I said before, that he has retained as riparian proprietor 68 cubic feet; that the City of Boston have, under no circumstances, taken more than 68 cubic feet, and that therefor the City of Boston is liable in damages to Oliver W. Whipple, and his grantee, the Wamesit Power Company, and to them alone.

There is one other matter that I desire to suggest, and that is, that the argument that has heretofore been made in regard to the Middlesex Canal Company having taken all the water of the Concord river, and that they did actually pay, or in law are presumed to have paid, all damages, applies precisely to the case of the Wamesit dam, more fully than to the Billerica dam, because this is water below that dam; and if they had the right to divert the water, and did divert it at the dam, and it is taken again for the public use, as has been heretofore claimed, that it applies precisely to the

Wamesit dam cases.

I now come to the consideration of another matter, and that is, how much water the City of Boston takes from Concord river when it takes the Sudbury river, as provided in the act of the legislature, under its taking, subject to the restrictions that I have heretofore mentioned. And here, Mr. Chairman and gentlemen, I claim that in estimating the amount of

water taken from the Sudbury river, and the amount of power taken away from mill-owners upon Concord river by that taking, the system of averages which has been offered in testimony and relied upon, is faulty, to a certain extent. I admit that in a large series of years, and over large areas of territory of equal sizes, the area of the water-shed will determine very nearly the amount of water produced in these rivers; but I ask your attention to one matter which I think has been admitted, and the whole case has been brought upon that theory, and that is, that the City of Boston cannot and will not take the water of the Sudbury river, the whole of it, so as to be felt by the mill-owners, except in the dry season; therefore, in the consideration of this case, the question is, how much water does the Sudbury river furnish in the dry season? for it is by taking away the water in the dry season that the damage is done. What is the duration of this dry season? The extreme claim, I believe, unless it is possibly, by the Saxonville mill, —the extreme claim, as far as Concord river is concerned, is six months, or from six to three is the maximum, and the minimum claim of the parties who have appeared before you. The City of Boston claims that there will actually result no taking away of water that can be beneficially and fairly used upon the Wamesit dam, except in the three summer months, July, August and Sep-The petitioners claim that they will be affected more or less, perhaps, for six months, the dry months, perhaps from April or May to October or November. That being the period in which they are damaged, then, to what extent is the water taken away by the Sudbury river? Now, although it might appear, and actual measurements of the water may show, that the average water, all day long, for every day in the year, for a series of years, furnished by the Sudbury river to the Concord, would be as the areas of the water-sheds, still in dry seasons, we claim, and we claim that we have proved, that it is not in that ratio, and that, instead of being 21 per cent., as claimed by the petitioners, the amount of water diverted will not be more than twelve per cent. of the Concord river. And, first, I call your attention to one fact that has been testified to here, and which I presume will not be denied, and that is, a large river yields more water in the dry season than a small river.

It appears in the testimony of Mr. Frizell, on page 696, that the Merrimack yields six-tenths of a cubic foot into the river per square mile; that the Concord yields one-third of a cubic foot per square mile; and that Hale's brook yields one-seventh of a cubic foot per square mile. Therefore, depending upon the size of the river, the amount of water

from different-sized water-sheds in the dry months is as oneseventh to six-tenths of a cubic foot per square mile. Therefore, we claim that to estimate the amount of water diverted by the areas of the water-sheds in the Sudbury and Concord rivers for the dry season of the year is not a fair estimate, and not one upon which the commissioners should make up their damages. And I will here call your attention to the testimony of Mr. Frizell as to the character of the last season. There has been considerable talk here to the effect that it was the dryest season that had been known for a series of years. He has testified (page 656) that he does not understand that it was the dryest season; on the contrary, he thinks there have been other seasons recently that have been dryer, so that this last year, as far as that theory goes, was not an exceptional year, and we may fairly deduce a general proposition from the facts known to us during the last sum-Therefore I claim that the Sudbury river did not furnish one-fifth of the flow of the Concord river, because we have shown that in the dry seasons the areas of the watersheds are not to be compared between small rivers and large rivers; and the Sudbury being small as compared with the Concord, the comparison between the water-sheds is not an invariable criterion by which to judge of the amount of power taken away from the mills upon Concord river.

The next thing I ask your attention to is a comparison of the gaugings of the Concord and Sudbury rivers for the months of July, August and September; and here I must ask the attention of the commissioners to another thing, and that is, that taking the average for those three months of the water furnished by the Sudbury river is not a sufficiently accurate criterion upon which to make up the damages; and for this reason: it appears that on the 31st day of July there was a very heavy fall of rain, and it brought up the flow of the Sudbury to a very large amount, some four or five hundred cubic feet, I believe, perhaps more than that, I do not remember the figures; but you will remember that, as indicated by the profiles, the extra flow of the Sudbury river lasted one week, and the highest amount of water was only for a single day, so that, although that very large flow might have lasted two or three days, or at the outside a week at that time, if it is averaged clear through July, August and September it will bring the general average of the river up to a very considerable extent, when you know that the water furnished to the mills upon Concord river by that flow lasted only for three days, or at the outside for a week, and that the greater portion of that heavy flow ran over the dam and was wasted, running, as was testified here, at the rate of

1300 cubic feet per second over the dam in the night. Therefore, when you average the flow of the Sudbury river with such a run as that clear through the three months, and say that that is power taken away from the mills upon the Concord river, it is not a fair criterion, I claim, by which to estimate the damages; but that we have a right to say that, if you are to take the average, you should so average it, that it is the flow in the Sudbury river during that storm that could be stored and kept and used by the mills; and if you average it in that way there will then be no question, by the gauging of the Concord river and the Sudbury river during the last year, that the Sudbury only furnished twelve per cent. of the water. I will state here that if you average it with that heavy rainfall, then an average is shown of sixteen per cent. furnished by the Sudbury river, but that extra four per cent. is not water that can be used by the mills, and was

not used by the mills except for three or four days.

Now, it has been testified, and I ask the attention of the commissioners to it, — it certainly seems to be not possible of explanation, although it is claimed that it can be explained, — it has been testified here that the flow of the Concord river at Billerica was from 425 to 550 feet per second, and that the flow of the Concord river during the same times was, at the Massic dam, 210 cubic feet per second, and I think that the only explanation that it is possible to make of that is the very thing which I think should not be taken by this commission in estimating those damages, and that is the system of averages. To show that there was from 542 to 550 cubic feet at the Billerica dam, they took the water throughout the year and averaged it, while at Massic dam they took the water during the dry months only, so that we claim, and we claim it with a good deal of confidence, that the commissioners, in estimating these damages, will not be guided by averages for the year, and will not even be guided by averages for the three months, but that they will take into consideration the fact, that a severe storm during any dry season, or two storms in succession, may bring up the average to a very considerable extent for the three months, when the actual benefit that the water is to the mills is by no means to be compared with the average flow of water through the three months. Therefore, we claim, on all the testimony there is (to be sure there is not as much as might be desired, but still, it is all there is), we claim, on this testimony, that Sudbury river furnishes Concord river, in a dry season, 12 per cent. of the entire flow; and in estimating the damages that we are to pay for taking the water, we claim that we should only be called upon to pay for one-eighth of the

entire amount of power that these mills can procure in the summer months. Those figures are upon the basis that the areas of the water-sheds are not the criteria upon which to judge in the dry seasons; that the gaugings show the actual facts before you for three months at least, and by those gaugings for one season, you have a better guide for your opinion and judgment, than by the areas of the water-sheds, or by any other evidence that has been brought or can be

brought before you.

Now, if the city have deprived the proprietors of the mills upon the Concord river, and more particularly upon Wamesit dam, of any amount of their power, and they have shown a title which satisfies you that they can petition here for these damages, and that they can be allowed them, then comes the question as to how much damage shall be allowed to the peti-The large body of the evidence put in before you has been to show the damage that was done. It is claimed here by the petitioners that we have deprived them of 21 per cent. of their power, and it is claimed by the respondents that they have only deprived them of 12 per cent. of their power, and therefore I think that the damage must be considered by the commissioners somewhere between these two points — between 12 and 21 per cent.; and it is upon that basis, I think, on the evidence, that the commissioners will feel bound to estimate the damages. Now, it is from 21 to 12 per cent. of the power taken away from these petitioners from one-half to one-quarter of the time. These are the limits. The amount taken away is between 12 and 21 per cent.; the time during which it is taken away is between one-half and one-quarter of the time. So the City of Boston is to pay, under these circumstances, at the outside, onetenth of the value of the whole power — from one-tenth to one thirty-second. That is, if we take away from the Sterling mill, for instance, which has thirty-six feet (supposing it to have thirty-six feet all the time), if we take away one-fifth of their power — that is, 14½ horse-power — for one-half of the time, then we are to pay damages to the amount of one-tenth of the whole value of the power. If the estimate is made according to the theory of the city, we are to pay one thirty-second of the whole value of the power.

Mr. Storey. How do you get at your one-tenth? One-

seventh of one-twelfth?

Mr. Child. One-fifth of the power one-half of the time would be one-tenth; one-eighth of the power one-quarter of the time would be one thirty-second.

Now, I do not know that anybody will contend that the City of Boston is bound to supply a steam-engine to every

one of these proprietors of the mills. If any one should contend it, I claim that we cannot be called on so to do; that we can only be called upon to pay damages for the water taken, and not to supply the power we have taken away; and the only theory upon which this evidence is competent, in itself considered, is, that it furnishes one item which may be considered in making up the damages that are

to be awarded by the commissioners.

One moment upon the question of steam-power. It has appeared in testimony here, that to furnish small power was almost impossible. Mr. Holmes testified that if anybody wanted 20 horse-power, it was better for all concerned that he should put in an engine of 100 horse-power. I do not suppose that it will be claimed by anybody, or considered by the commissioners, that therefore the City of Boston is bound to put in 100 horse-power, but that that would be the best way for the proprietor of a mill, because he could use it advantageously. Now, steam-power, as has been testified to, is worth \$60 a horse-power under the circumstances in which these mills are, having boilers and all the arrangements necessary for producing steam. Mr. Mills testifies that the value of steam-power is \$60 a horse-power, and Mr. Farrington testified that the value is \$60 per horsepower. Although it has been testified that the value of a horse-power is \$200 per year, that had reference to places in the City of Boston where land is worth \$50 a foot, and it is not a fair criterion upon which to judge the value of horse-power to these mills in Lowell, where land is worth twenty-five cents a foot, perhaps. We claim, then, in regard to steam-power, that we are not called upon to furnish it, because it appears from Mr. Mills' testimony, that while steam-power is worth in Lawrence \$60 a horse-power, water-power is worth only \$20 a horse-power in the same place, under the same circumstances; so that the power asked for is a power that is worth three times as much as the power we take away from them, and therefore it ought not to be considered, and we ought not to be called upon to pay damages assessed upon any such criterion, because we are not bound to give them a power that is three times as good as the power which we have taken away. I suppose the only true theory upon which these damages are to be assessed is damages in dollars and cents for the power that has been taken away.

Mr. Storey. Mr. Mills says, on page 74, in answer to this question by Mr. Butler: "My question is this: What, in your judgment, from your calculations, does it cost a year to make a horse-power of steam, the engine

being already prepared, a portion of the boilers being heated, and an engineer and fireman to attend to a portion of the boilers?"

"A. I haven't the calculation here; but from what data I have here I conclude it would not be far from \$60 per annum."

Mr. Child. I believe it has been testified that all the mills upon this canal have their boilers and have all their arrangements made for making steam; that they have their firemen employed, and that the only additional expense would be that of putting in the engine and running steam through the engine; and it might be used for all other purposes, as it has been before. So that I think it is fair to claim, that, in regard to these mills — although I might not claim it in regard to mills where no steam is used — but in regard to these mills it is fair to claim that the additional expense of putting the mills in a condition to use steam would be very small, and that we can safely estimate it at \$60 a horse-power.

I was saying that we claim that a fair estimate, to be made by the commissioners, in ascertaining the damage done by taking away the water from the Concord river by the City of Boston, was between one-tenth and one thirty-second of the value of the whole power at these mills upon the Wamesit dam; and I claim that upon the evidence the commissioners must be confined between those two points, for these are the maximum and minimum points, as claimed here by the petitioners and by the city, as appears in the evidence produced.

Now, to ascertain the value of the power, we claim that the fair and proper way would be to take the market value of the property before the power is taken away, and the market value of the property after the power is taken away, so that if we could get at it exactly, the difference in the price would be the proper estimate for the damages. To get at it exactly might be perhaps very difficult as a matter of evidence; and the theory upon which this commission is appointed is, as I understand it, that they should examine the subject, and from their knowledge, and from their familiarity with property of that kind, they may make a fair estimate of the value of the property in that way, and ascertain the difference. I will illustrate the absurdity, as it seems to me, of the claims of these petitioners, as I understand them, in this manner: For instance, Mr. Talbot testifies that the amount of his plant in Billerica connected with the mills is \$400,000. That comprises his boarding-houses, all the land he owns at Billerica, all the mills and all the machinery. Now, if you take away the entire power, he would have left his lands, his machinery, and all the property he has got there; but he could not use it. Suppose, for instance, that that property would be worth, under those circumstances (and I think that he could not complain certainly), twenty-five per cent. of the whole value. Supposing after you take away his power entirely, you leave him property there which would be worth \$100,000; then there is \$300,000 damage done him by taking away the whole of the water-power. The outside claim that could be made would be that we had taken away one-tenth of that power, and therefore we should pay him one-tenth of that damage; and one-tenth of \$300,000 would be the damage which the City of Boston would pay Mr. Talbot, that is, \$30,000. But it is claimed that we have deprived Mr. Talbot of 90 cubic feet per second, about 75 horse-power; that we must give money enough, the interest of which would produce \$100 per horse-power, i. e., \$7,500 per year, equal to 130,000 to 150,000 more than one-third of the whole value of the power.

Again, suppose that the Sterling mills are worth — I don't

know that we have any precise evidence upon that.

Mr. Butler, No; they have not put in any evidence, in any of these cases, as to the worth of their property.

Mr. Shattuck. There is evidence that bears upon that

question.

Mr. Child. There has not been any evidence put in as to the value of their property, and therefore I cannot consider it; but suppose, for illustration, that one of these petitioners had property worth \$100,000; we take away all his power, and that leaves him \$25,000. We are to pay, at the outside, for the one-tenth of the power that we have taken away, which in that case would be one-tenth of \$75,000—7,500. I think that that is a fairer way and a better way of estimating than any evidence or any theory that has been put in here by the petitioners for you to estimate upon, and certainly it is much fairer than estimating upon the supposition that we are to put in steam-power, which in a mill is worth a great deal more than water-power, and that we are to provide that much more valuable power, and still we are to pay for the whole of it.

Then, again, I claim that the estimate that I have made, one-tenth, as the maximum, and one-thirty-second as the minimum, is a fair and liberal one to those petitioners, for it is perfectly evident to you, gentlemen, as men of common sense, that the actual damage done to these mills by taking away this power, is, that in three months of a year, when they are doing a profitable business, they are, by reason of our taking away their power, deprived by that means of

doing one-fifth more business for three months. We have prevented them from getting one-fifth more profits for three months, and therefore that is the actual damage that is done them; and I say that it cannot be believed that whatever sum you may award these gentlemen, they will use it for the purpose of increasing, or supplying or supplementing this power, but they will probably endeavor to get along without any expenditure and use that for a capital in their business. So that, in the various ways in which you can look at the question of the amount of damages, it seems to me, after all, that the testimony of experts as to steam-power, or anything of that sort, while it is an aid, is of small value compared with the fair, common-sense view of practical men as to the amount of damage that is done by taking away this small

amount of power.

Now, there is one other suggestion made, and one other theory which has been acted upon in regard to this evidence; and that is, that the petitioners shall show to you that they are damaged so much every year, and that when they have shown you that, you shall give them a sum of money which, put at interest at five per cent., as claimed by one of the petitioners, would bring in an amount equal to the yearly expenses. Now, we claim that that is an entirely erroneous theory upon which to estimate the damages, and an unfair one; for, in the first place, you make a presumption which is not a fair presumption, and that is, that this mill property is to last forever; that it is going to be carried on forever; and that this money will always be needed, or the interest of this money will always be needed, for the operation of these I claim, in accordance with the ordinary and usual result of all business enterprises of this character, that that is a presumption that would not be carried out in fact, and the result would be, that at the end of a certain length of time, longer or shorter, these parties would have had their damages paid to them every year as they went along, and then they would have the capital sum left, after they had finished and given up the business. I say, therefore, that to supply them with a certain yearly sum forever, is not a fair way of ascertaining the damages. Of course it is difficult to estimate matters of that sort exactly, but I claim that it is as difficult, and more so, to presume and to say that the amount of money to be paid is such as will forever furnish a certain income; and I think it may be fairly put upon the way men generally do business, and that is this: No man in the manufacturing business would expend \$100,000 to save \$6,000 in expenses each year, because it would be tying up an amount of capital which, in the practical, ordinary pursuits of life,

can be used to very great advantage, and I claim, that if you were to form a judgment upon any such theory, then the percentage should be at least twelve per cent., and not five, as is claimed here, i. e., an amount which must be expected to yield twelve per cent. I claim that the whole theory is incorrect and unfair, and not one upon which the commissioners can base their judgment, but it has been argued so much here that I feel called upon to say something about it. The very best that could be fairly done would be to grant to these petitioners a sum of money which, invested at twelve or twenty per cent., would produce a yearly income equal to

the additional expense.

I believe that I have touched upon all the points to which I desire at this time to call your attention; and I have en-deavored simply to suggest matters rather than to argue them, or to quote the evidence sustaining them. But I do believe that upon the question of the right and title of these petitioners to come here and claim damages, they can claim them only under the riparian proprietor, and that, in order to claim them under the riparian proprietor, they must show that that riparian proprietor has granted all his power away, or so much of it that the residue left will be less than the City of Boston propose to take; and that, therefore, they should come here either in the name of the riparian proprietor, or else, unless they can show that the entire power has been granted away by the riparian proprietor, they must come jointly with him in their petition; and that, in the next place, the amount which we have taken away from the Concord river is twelve per cent., and that is all we should be called upon to pay for, because the damage that we have done is confined by the testimony to the dry season; that is the only time in which it can be considered, and during the dry season we have taken away only twelve per cent. of the power; that the power is to be estimated upon that basis, and that the damages are to be made out by the difference in value between the property as it is to-day and the property as it would be after the taking away of this amount of power; that the petitioners, in order to get at that damage, are bound to show the value of their property, and, having shown that value, then it leaves the question for you to decide what the difference in value will be; not having shown that, then it is the province of the commissioners to take their own views in regard to it; — and I claim that, upon the evidence as introduced, and upon what you have seen in regard to this property, the amount of damage is very much less than has been claimed by any one of the petitioners, and that, by applying that test to this property, from your own knowledge of values, you will find that to be the case.

ARGUMENT OF GEORGE O. SHATTUCK, Esq.

Mr. Chairman and Gentlemen: — I represent here the claim for damages to two mills situated on the Wamesit dam. One of them is the Sterling mill, which is a flannel mill, with seven sets of machinery, and a right to thirty-six cubic feet of water per second under the Whipple deed. The other is called the new Belvidere mill, which has eight sets of flannel machinery, and a right to twenty-seven cubic feet of water per second. It is admitted that the flow of each foot of water affords about two effective horse-power at the mill. That is the theory upon which the Wamesit Company goes, and it is the testimony of our witnesses. Our claim is for damages to that property by taking a certain proportion of the water.

It is not necessary to consider the exact value of that property, but it is desirable to know within reasonable limits what it is worth. Of course it is difficult at this time to determine the exact value by any sales; and we are obliged, therefore, to depend on the opinions of men and upon other facts which have been introduced. The Wamesit Power Company has sold water, with the use of the land on the Wamesit dam, which we have, at \$100 per horse-power, fur-

nished upon the wheel.

Mr. Butler. In no case.

Mr. Shattuck. I am relying upon the testimony, and not upon the statements of counsel. Mr. Hiscox stated that he paid them \$100 per horse-power. It is true that Mr. McDaniels said that they called it \$75 for the horse-power and \$25 for the land, and it was not warranted for more than nine months in the year.

Mr. Butler. Mr. Hiscox built his own buildings, and

left them when he went away.

Mr. Shattuck. Mr. Hiscox stated that distinctly. He put up his buildings: they did not furnish them to him. But, at any rate, they charged \$75 per horse-power, with something for the use of the land. We have land there, and the value of that land will be reduced just to the extent to which the effective power is reduced; and calling the 72 horse-power of the Sterling Company worth \$100 a year each would give us an income of \$7,200 a year, without taking into account the buildings or the machinery, except the water-wheel. Of course that would give us a large es-

timate for the value of the property. Taking the new Belvidere mill and estimating that in the same way, it would give us \$5,400 annual rental for the property and buildings, and there is no contention that, including those two, the rental would amount to \$100 per horse-power per year. Therefore that would give us an annual rental, without the machinery, of \$7,200 for the Sterling mill and \$5,400 for the new Belvidere mill. Then I take the testimony of Mr. Charles Faulkner (whose mills are substantially like ours), than whom there is no fairer or more intelligent judge in this Commonwealth. He has seven sets of flannel machinery in his mill at the Talbot dam, and he tells you that their mill property is worth about \$125,000. As I say, I do not care to go into any accurate investigation of this matter, but approximately from \$100,000 to \$125,000 may be considered, therefore, as not an unreasonable estimate of the value of this property. It is the injury to that property for which you are to give us compensation. The question is how much are the water-power, the buildings, the land, the machinery, diminished in value by the taking of whatever water the city takes. That is the question for you to pass upon.

Before coming to the consideration of this question of fact, it is proper for me to allude to one or two questions of law which have been presented by the city. In the first place, the indefatigable counsel for the city has hunted up and produced here the extinct charter of an abandoned canal company, and held it up here before the city to protect it against our claim. That question has been so fully discussed by the eminent counsel who have preceded me, that I do not care

to consider it.

In the next place, it is contended that we are not entitled to the benefit of the flow of Concord river as it now is, but that we must go back to what is called its natural flow. Now, if I understand the effect of forests upon rivers, we should be glad to go back to the time when the banks of the Concord and Sudbury rivers were covered by unbroken forests, and when every fallen leaf was a reservoir through which the water falling in March and April slowly trickled down to the river in July and August, and kept up an equal flow which no art of the city, no provision of reservoirs, can provide. We cannot have that; we must take what is practicable and reasonable. It is a question of damages, and you are to consider, therefore, not necessarily the exact flow of to-day, but what, with such improvements in the way of reservoirs as may naturally be expected, is likely to be the flow of the Concord river in the future. It is for that flow of water for the loss of which we claim damages.

Another question is, whether we are to have our damages assessed once in three years, but upon that question it is unnecessary for me to say anything, because it seems to me that the Wenham pond case has settled it, even if there were any doubt about it without any decision by the court.

I now come to the discussion of the main question of fact. As I may have another opportunity, I prefer, before answering the arguments which have just been presented by my friend the junior counsel for the city, to see them on paper, and, if then they seem to me to have more weight than I think at present they are entitled to, I may ask for an opportunity to say something in relation to them.

Mr. Butler. That will place me at the disadvantage of having to reply to you without knowing what your reply is.

Mr. Shattuck. Certainly it may lead to that. If you are very strenuous about it, I will agree not to answer them. I will, unless something surprises me on reading the argument.

In this discussion I have no desire to consider the City of Boston as in the attitude of a spoiler. We come here simply for fair damages. I look upon the city rather as a sovereign in the exercise of the highest powers with which courts have to deal, and in the discharge of great duties for the protection of the lives and the health of her inhabitants. This claim is to be met in no illiberal spirit. And I desire to state here, that, while it has seemed to me that the counsel for the city have felt it their duty, in discussing questions of law, to stand on the extreme boundaries of their rights, and sometimes even to step beyond them, in the discussion of facts and the evidence of facts nothing substantially has been put in here which I desire to contradict. So far as the scientific testimony introduced here by the city is concerned (and we must consider it as endorsed practically, most of it, by the eminent engineer of the City of Boston, who has not contradicted a word of our testimony), every observation made by the witnesses on the part of the city has contributed materially, as it seems to me, to our advantage, and to show what the truth is with reference to this river; and, except in some minor details, there has not been even a theory advanced by any scientific man produced here by the City of Boston which I desire in any way to controvert. I may say, that, if the City of Boston is placed in the attitude of spoiler in any degree, it must be because you, gentlemen, do not give us full and adequate damages.

Now, gentlemen, there is one consideration which lies at the basis of this case. It seems to me that the cardinal principle in this case is this: You are not here to provide us

compensation for an injury which we have actually suffered. There will be no week and no day in all the future when we can sit down at the end of the day or the week and count up, looking backwards, the exact deficiency of the water, and say you must pay us for that. During all time, the prudent mill-owner must grapple with the same uncertainty with which we and you are contending to-day, in determining what provision he is to make. As Mr. Stott has told you, in the morning, when he goes down to the mill, as a prudent man, he cannot run the risk of having his thousand spindles and his hundred laborers idle, and he must provide every morning for the largest contingency. That is not controverted by the city. On the contrary, it was admitted practically by Mr. Farrington, and Mr. McDaniels said, "We are watching the water all the time, but sometimes we get caught." You are not only, therefore, to make provision for the days when no water will be running, when all this water will be taken, but you ought even to enable us to provide for those days when there is a reasonable uncertainty in the morning as to whether water will be furnished us. you forget this principle, if for any moment that is shut out of this case, we are liable to suffer an irreparable injury.

Bearing this principle in mind, I come first to the question, What water will the city take? By their adjudication they have taken on paper all the water in Sudbury river. They have taken all the water-rights which they could take by taking Sudbury river, and, except the limitations which are imposed by the laws of nature, they have offered no evidence to show that practically they will not take it all. They are building an enormous conduit from the Sudbury river to the Chestnuthill reservoir, and you have ruled that it was competent for them to show that they do not take the whole, — I mean all that it is practicable to take, — and they have not shown it. By the building of reservoirs and holding back the water when it is high, and by building an enormous conduit to the City of Boston, I have no doubt they will take it all. all know that if it is once practicable to have all the water of Sudbury river in Boston, every gallon of it will have a market; it will be demanded and used by the citizens of Boston. But I stand simply on the presumption of law. They have taken it all by their paper title; they have not offered us a syllable of evidence to show that they will not take all that they can; we know that if they take it, they can sell all they have; and therefore I say I stand here with the proof that they will take it all, except in time of freshets, when it is beyond their power to take it, and then, gentlemen, the water of Sudbury river is of no use to us, because

it makes back-water, and we prefer not to have it. So that, so far as this case stands, you are to presume that they will take all the water of Sudbury river from us, when the water would be of any value to us. I do not propose to add anything further to that branch of the case. Of course, there is another question to be considered presently as to how much of the year we shall be damaged by it; but I say, so far as the taking of the water of Sudbury river is concerned, it is to be assumed that they will take all that can be of any value to us.

I now come to the question, What is the proportion which the Sudbury furnishes to the Concord? I have sometimes thought it was hardly worth while to allude to this question, because it was practically conceded that the Sudbury water ran over the dam of the Essex Company at Lawrence in a proportion based on the water-shed of the Sudbury river, and it would certainly be a comedy in the eyes of all the world except my clients, if you should find that a quantity of water was furnished by the Sudbury river to the Essex dam, which did not run over, or in some way pass by the Wamesit dam. But I am willing to meet it, and the evidence upon this point is clear. The water-shed of Sudbury river, as presented here, is about 73, 75.5, 77.8.

Mr. BUTLER. Where did you get the 77.8?

Mr. Shattuck. You admitted, in the argument in the Talbot case, that that was Mr. Davis's measurement, but you accompanied it with certain explanations, which properly enough go with it.

Mr. Butler. Pardon me; that is not evidence. I have

not undertaken to swear for my client.

Mr. Shattuck. I think that the admission of counsel in

a case is pretty strong evidence.

Mr. Butler. It was not evidence in your case. We agreed that the evidence in the Talbot case should be taken. An admission of counsel in argument is not evidence. I am going to admit, for instance, a great deal of water at Billerica, which I shall contend does not get down there.

Commissioner Russell. It was Mr. Davis's statement that was admitted as testimony. I supposed it to be covered by the agreement. I do not know that the admissions

of counsel, made in argment, are.

Mr. Shattuck. It was not made in the argument. Judge Abbott stated it as a fact, and then Gen. Butler conceded it. It was not any part of his argument.

Mr. Butler. For this purpose, I am willing to take it that Mr. Shattuck supposed that everything had been admitted.

Mr. Shattuck. I do not care to go into it, because I do not think it is of any very great consequence. It is somewhere from seventy-three to seventy-seven. It is conceded also by the City of Boston, and proved by the testimony of three or four witnesses, that a certain allowance for evaporation and wastage is to come out of the lower Sudbury and the Concord, and that the waters of the upper Sudbury are not reduced by those, but come without any deduction of that sort.

Mr. Butler. I do not concede that.

Mr. Shattuck. Do you mean to say that your other concession was improvident?

Mr. Butler. No, sir; I have made no such concession. I suppose the water of Sudbury river has the same proper-

ties and characteristics as any other water.

Mr. Shattuck. This is the testimony of Mr. Mills: "I have no question that there is, after the taking of this water from Sudbury river, sufficient water coming in to supply the evaporation, and all the wastage in the territory below, so that the cutting off of this upper Sudbury water would be a reduction of the quantity at Wamesit dam or at Lawrence by just the amount of water cut off" (p. 91). Mr. Shedd says the same thing; Mr. Frizell says the same thing. Now Gen. Butler says, "I suppose that is so;" and, as they have offered no evidence to contradict it, it is not material whether the concession is accepted as an admission or not. Mr. Frizell says, that, according to experiments, the evaporation in the Sudbury and Concord meadows would amount to about forty-one feet per second. That was only four months in the year. Now, I have no wish to attach any undue importance to that, or to any of these measurements; but, taking these together, it would bring the percentage up to nearly twentyfour per cent. at the maximum; and the Sudbury would furnish at Wamesit dam about twenty-four per cent. of the Concord, based on the water-shed and on this allowance for evaporation. I have, therefore, thought it not unreasonable, not unjust to the city, and no more than fair to my clients, to call the amount furnished by the Sudbury at Wamesit dam twenty-two per cent. of the Concord, taking it winter and summer. It is a little more than seventy-three, it is less than seventy-seven, and makes a very small allowance for the evaporation. That seems to me, on a careful examination of the testimony, to be a fair result of a comparison of all the testimony in the case, and therefore I shall assume that to be the basis. If the commissioners think it ought to be a larger percentage, I hope they will give it to us. Of course if it ought to be less, a deduction is to be made.

Then we come to the evidence of Mr. Fteley, that, at a certain period in a dry time, there was only about oneeighth part as much water flowing in the Sudbury at the city dam as was flowing in the Concord at the Wamesit dam, and the question is as to the effect of that testimony. Mr. Shedd, who ought to know, and who is an intelligent engineer, and who probably knows as much about Sudbury river as any man living, — because he spent a whole season in investigating it, — testifies, that, in his judgment, the Sudbury river furnishes its full proportion of the water of Concord river, in dry times and wet times, and gives his reasons for his judgment. He says that the water-table which is raised by every increase in the depth of the Concord river, not only extends through these meadows, but miles beyond them. Now, according to my calculations, if those meadows were raised one foot in height, they would store almost two billions gallons of water; and when you add to that this immense area outside of the meadows, where the water is stored in the soil, and percolates slowly out as the stream falls, no person can tell with certainty when a drop of water or a gallon of water which passes over the city dam will reach the Wamesit dam. It may pass underground, miles away, into the meadows and fields in the neighborhood of Concord river, stay there for days and weeks, and then percolate slowly back, and find its way down to the Wamesit dam.

But I am willing to leave this on the testimony of Mr. Fteley himself, which is very clear and to the point, and, with the leave of the commissioners, I will read a few words from his testimony. He took the average flow of the Concord, and the average flow of the Sudbury, for about fourteen days, after the rainfall of July 31. It turns out that the Sudbury furnished a little more than one-fifth; that is, the proportions were 1,476 cubic feet in the Sudbury, and 7,084 cubic feet in the Concord. Now, I will read his testimony:—

[&]quot;Q. Now, it turns out that during those 14 days, the flow of the Sudbury was a trifle more than one-fifth the flow of the Concord?

[&]quot;A. Yes, sir; so I find it.

[&]quot; Q. Now, I want to know if you can tell, taking your knowledge of the Sudbury meadows, and the extent of them for twenty miles and more, how much of the Concord river flow has come from the Sudbury river during the period?

[&]quot;A. I don't see that I can answer that question, sir.

[&]quot; Q. Can you tell us, from any knowledge that observation or experiment has afforded you, that the Sudbury did not contribute

its fair proportion to the flow of the Concord during that whole period; that is 21 per cent. about?

"A. I should say that there is no reason to suppose that it did

not contribute its fair proportion.

"Q. Whether from any observations you have ever made, or any experiments that have come to your knowledge, you can say that the Sudbury did not contribute substantially that proportion of all the water that flowed through the Concord river?

"A. No, sir; I can't say so.

"Q. Is not the recognized test of the value of the contributions of different parts of the water-shed of a river the measurements of the water-shed?

"A. It is the general practice.

"Q. Do you know of any better test than that?

"A. No, sir. Excuse me — there is a better test, if you could

get gaugings for a great many years.
"Q. But, taking gaugings for any one year or for less than three months in one year, would that, in your judgment, to any extent control the argument to be derived from the water-shed?

- "A. Experiments on the flowage during a certain number of months would give a pretty good indication of what the flow was at the moment the flow was taken. I should say that experiments during a very wet season or during a very dry season might give an indication of the extreme flows of the minimum and maximum.
- " Q. That is clear; but would the proportions contributed by the different parts of a water-shed, either in a wet or dry season, as ascertained by measurements during three months, be any substantial indication of the permanent flow?

"A. It would be an indication, but not so as to weaken the general rule" ---

the one based on the water-shed.

Something has been said here of the fact, which must of course be conceded, that there is a higher average in a large stream than a small one. Hale's brook, as has been stated by my friend who has just argued, furnishes, in a dry time, very little water in proportion to the number of miles in its water-shed; the Concord, a larger proportion; the Merrimack a larger still. But the explanation of that is obvious. Here are local showers all over the country, covering small areas; here are springs; one place is dry one year and wet in another, and when, therefore, you have the average contributions from a large area, the larger the area the higher the max-It is, as I said in my opening, like a savings-bank. If there was only one depositor, he would put in and draw out, and the bank would have a large sum or a small sum, or nothing at all. But when you go over the country and get the contributions from tens of thousands of depositors, it keeps up the average, and upon the same principle the

minimum supply of a large river is greater. Mr. Shedd states that that is the reason, and there is no other known reason. The theory that Mr. Herschel propounds here, which is ingenious, which anybody might suggest, has no real basis in fact. Hale's brook is lower down than Concord river, and yet Hale's brook has this very small average as compared with the Concord. It is owing to the fact that the Concord has a wider field to draw from, and therefore you have an average made up of a larger number of contributions. So that I shall assume that, upon the evidence, we are entitled to the full proportion which the Sudbury water would furnish, with such additions as ought to be allowed for the evaporation, which is a fixed quantity, and would be just as large without the contribution of the upper Sudbury as it is with it.

I wish to add one other to the considerations which I have already presented in favor of our claim: that we are entitled to consider that twenty-two per cent. of the water at the Wamesit dam is furnished by the Sudbury river. We can, of course, have no better evidence in this case than an offer deliberately made, and in good faith, by the city. It was not any offer of compromise, but an offer to make so much in payment, and I will read:—

"Mr. Butler. I now offer, on behalf of the city, in mitigation of damages, or compensation for any water taken, an amount of water in the river, to each of these complainants, to flow through the race ways and penstocks of each of these complainants, equal to the entire flow of the Sudbury river, to which they are entitled under their several deeds put in the case. That is to say, assuming that the flow of the Sudbury is 22 per cent. of the waters of the Concord (which is the highest amount claimed), we offer to the Sterling mill, who have thirty-six cubic feet per second, an amount of water equal to 22 per cent. of the thirty-six cubic feet, and to convey it, and file a deed, if competent for the city to give a deed of that water, to the party forever.

"Mr. Shattuck. We should be glad to get it, if we could see any practical way to take it, and should heartily accept the offer.

But there are difficulties in the way of getting it.

"Mr. Butler. If you object to the deed, of course we need not file the other deed; but I offer to file the other deed if this is admitted.

"Commissioner Russell. You mean to say that you offer such a deed in connection with this one?

"Mr. Butler. Yes, sir.

"Mr. Shattuck. If you will convey all the water there is in the sixty-six feet, so that nobody can use the water for the Wamesit mills unless there is more than 288 feet, I do not believe there will be any difficulty in settling. "Commissioner Russell. We must see what you propose to offer in the way of evidence, not what you propose to offer by way of compromise to these parties. We have nothing to do with that as commissioners.

"Mr. Butler. There is where I am sorry to differ from you; it is not pleasant to do so. I think we have this right, under the obligation imposed upon us to make compensation. I think you will find a case to that effect. However, I am trying to get along. I make my offer in good faith, and about a matter of very high concernment. These gentlemen have a right to draw so many feet of the water, and that is all the right they have. When the water is at the height of the permanent stone dam, this will not harm them. When it is below that, we offer them all the water they can possibly have. I have made that offer heretofore—made it to them in person; but I have not been able to get anybody to take any water; they all want money."

I did not suppose that the counsel would come in here with an offer of compromise, because it clearly would not be competent. I say therefore we have an offer on the part of the city, based on the theory which supports our claim. It is a reasonable one. It is not anything which the counsel for the city will retract. It was simply a fair and reasonable offer, and if there had been no other difficulties than might occur without consideration, we might have accepted that offer; but there were reasons which stood in the way, and we did not accept it. But as an offer made to us, it is competent for you to consider it in determining whether our theory as to the amount of water which we are entitled to is correct, or not.

I shall assume, therefore, that the Sudbury river does furnish 22 per cent. of the water at the Wamesit dam.

The next question is, what is the flow of the Concord river at the Wamesit dam?

As we are entitled, as has been stated already by the counsel for the city, to no more than thirty-six feet per second in one case, and twenty-seven feet per second in the other, when the water equals 288 feet per second, if the flow, after the city has taken its water, is 288 feet per second, then we suffer no damage, except, perhaps, for loss of head. That we concede. And, for a similar reason, I apprehend the different mill companies in Lawrence have made no claim for damages. The flow of water is not reduced by this taking to a point which will affect them, and I shall have presently to consider that question in reference to the case of the Belvidere and the Middlesex Company. If, therefore, the flow of the Sudbury river before the taking exceeded 369 feet per second, then the taking of 22 per

cent. does us no harm, except from the loss of head; and the question before us is, how much of the time does the flow not exceed or fall below 369 feet per second? There may be a small margin of cases where the flow may be uncertain, and we might, as prudent men, be entitled to provide for a probable insufficiency in the flow where none may occur, because, as I have already suggested, you are to give us something which will enable us to do what a prudent and

reasonable man would do to meet a contingency.

As instructive upon the question of the amount in Concord river, I propose first to refer to the deeds of Mr. Whipple. His deeds contain a covenant that the canal shall be made large enough to carry 288 feet per second without drawing the water at any raceway more than six inches below the top of the stone dam. That is, if there is a loss of head of only six inches between the Wamesit dam and Wood (because Wood and the Bleachery have grants on the same terms, and are at the lower end of the canal), they are entitled to that proportion; but there is also a covenant that a flash-board is to be kept there; and there is a covenant by Whipple that he would make the canal large enough to furnish that water. That covenant has never been performed, and the canal does not at that height of water furnish the amount of 288 feet per second, as appears by the testimony of Mr. Herschel. But this deed tends to show that the reasonable loss of head which was contemplated was not to exceed six inches. It has been stated here by one of the witnesses that if you draw down the head more you can get more water through the canal; but it is clear that there will be a point where the diminution in space will more than offset the increase in the rapidity of the flow, so that nobody can tell how far it will answer to allow the head to go down before you will diminish the amount that runs in the canal. There is no evidence on that point. Mr. Herschel said he could not tell without a very careful examination; but this deed shows that the reasonable flow which it was supposed would not draw down the water at the river at any particular time would be about six inches in the whole length of the canal, which is equivalent, as Mr. Herschel says, to four and a half inches between the Wamesit dam and the Lawrencestreet bridge. We wish to ascertain, therefore, how much water flows in the Wamesit canal, with this reasonable loss of head, when the water is as high as the flash-boards and runs over a little and when it is nearly as high as the top of the stone dam. Now, upon these questions there is no conflict of evidence. I think it is established, as well as any such fact can be established, by the testimony of two engineers,

— one from each side. Mr. Herschel testifies that "if the water at the head-gates was even with the top of the stone dam, and the water at the Lawrence-street bridge was 41 inches lower, it would carry about 220 cubic feet per second." Mr. Frizell testifies that when the water was even with the top of the flash-boards and there were $\frac{6.8}{10.0}$ of a foot (more than six inches loss of head between that and the Bleachery or Wood's raceway) there was a little short of 300 feet per second running in the Wamesit canal, and there was a loss of height during the day at the Wamesit dam of only about ²¹/₁₀₀ of a foot. Now, that shows as conclusively as anything can that with the water just running over the flash-boards there is about 288 feet per second, with a loss of head of about eight inches in the canal. We may safely assume that there was about 288 feet running in that canal, — a little, perhaps, in excess of it, - when the water is just running over the flash-boards. That, there is no controversy about. Mr. Herschel made one measurement on the 20th of March. and found 368 feet running in the canal, but the difficulty with this measurement is that we don't know what the head was outside. To be sure, Mr. Tilton says that in the morning there was six inches on the flash-board, but the next morning it was larger, — there was a rising river. The river was rising and continued to rise, and went up to thirty and thirtysix inches in a very short time; so that that particular measurement, being made on a rapidly rising river, is not by any means instructive; in fact, it ought to be left out of the case as of no value whatever. Mr. Herschel then says, on crossexamination, that if there had been a little less loss of head the flow would have been reduced to about 280 feet, and the reasonable loss of head is what we are to take; and I shall assume, with this evidence, which is not contradicted and cannot be controlled, that the amount flowing in the canal, when it is even with the top of the flash-boards, does not exceed 300 feet a second, and is probably about 288 feet, and when it only comes up to the top of the stone dam it is about 220 feet per second. Now, with these facts proved, the testimony of Mr. Tilton and his observations for a period of two years become of immense value. We have also the measurements made by the city at the time that Mr. Tilton was taking the measurements. I will read the result for a few days: -

"1876. August 10th. The depth of water on the flash-boards at 8.30 A. M., or between 8 and 9 o'clock, was six inches; the flow was 332 feet per second." (That was the average flow for twenty-four hours, and I suppose when the

flow in the river is as large as that, there is not a very great difference between the different hours of the day and night.)

Commissioner Russell. Measured where?

Mr. Shattuck. I was going to add at the end that this included Hale's brook, which makes a considerable addition. These measurements are at Massic falls.

Aug. 11, 5 in. 292 ft. water per second, including Hale's brook.

66	12, 5 in. 253 ft.	66	4 6	66	66
6.6	14, 4 in. 214 ft.	6.6	6 6	66	6 6
	15, 4 in. 179 ft.		66	66	66
66	16, 3 in. 183 ft.	66	66	6.6	66

The water from Hale's brook probably at that time amounted to nearly 20 feet per second. It varied all the way, but I find by comparing —

Mr. Butler. These are as appears over the Massic

falls?

Mr. Shattuck. The Massic falls and the average for 24 hours. From this evidence I contend, and it seems to me to be a fair assumption, that if the water at 8.30 o'clock in the morning does not exceed 6 inches over the flash-boards there will be less by a considerable amount than 369 feet per second running in the river, and we shall be affected by the loss of the Sudbury river. Of course, in the case of an extraordinary fall in the river we should be affected very largely; in the case of a rapid rise after 8.30 o'clock in the morning we might not be affected; but this is the best evidence that can be furnished in this case, and we must act upon it. Therefore, we wish to ascertain during the years from April 1st, 1874, to April 1st, 1876, the period during which Mr. Tilton measured, how much water there was on the dam at 8.30, or between 8 and 9 o'clock in the morning. I have taken from his table as printed the number of days when it did not exceed 6 inches on the Wamesit dam in the morning. In April, 1874, there were eight days when it did not exceed it; in May, 1874, there were no days when there were not over six inches; in June there were eight days; in July, 31 days; in August, 31 days; in September, 30 days; in October, 31 days; in November, 30 days; in December, 31 days; in January, 31 days; in February, 26 days, and in March, 7 days, making 264 days between the first day of April, 1874, and the first day of April, 1875, when there was a flow at the Wamesit dam, so small that we were affected by That is 8 months and 24 days.

Beginning with April 1, 1875, in April there were no days when it was less than 6 inches on the dam at half-past eight;

in May there were 7 days; in June, 19 days; in July, 31 days; in August, 31 days; in September, 30 days; in October, 27 days; in November, 17 days; in December, 20 days; in January, 31 days; in February, 18 days; and in March, 19 days—that is 8 months and 10 days, making 250 days that the flow was so small that the taking away of 22 per cent., or what the Sudbury river takes, would affect our mill-power. It is a most extrordinary commentary on the effect of the rainfall. Some months when there was a very large rainfall there was a very small flow, and vice versa, but that is something which it is not necessary to go into; that is at Lake Cochituate.

Mr. Butler. The less said about that the better.

Mr. Shattuck. You will observe we are going on the theory of the city, not on any average, but on actual observations. There is another fact which is pertinent. Mr. Tilton, who made these measurements and who seemed to be a careful observer, said that when there was not over 4 inches on the dam at half-past eight it usually came to a drizzle or didn't run over at all sometime during the day, and if there was not over 3 inches it ceased to run over entirely during the day; therefore I have made another calculation of the number of days when it did not exceed 31 inches, because when it did not exceed 31 inches upon the dam in the morning, we practically lose the whole of our 22 per cent. This is the time when the river did not run over all day. It shows that there was not flow enough in the Concord river during the day to more than supply the Wamesit canal when it takes 300 feet or a little less than 300 feet per second. Before coming to that, I will read what Mr. Tilton did say: —

" Q. If it did not run over more than three or four inches in the morning, wouldn't you expect it not to run over at all sometime during the day?

"A. If it ran over three or four inches, I should expect it

would drizzle over all day, until towards night.

"Q. If it didn't run over more than four inches at half-past eight in the morning, there would be sometime during the day

when it wouldn't run over at all, would there not?

"A. I should think, if it ran over three or four inches in the morning that we could start, and along in the afternoon, or about noon, the Billerica water would get down and help it, so that it would drizzle a little mite over the flash-boards.

"Q. Hardly run over, would it? You would not call it running

over, would you? "A. No, sir."

That is his statement: up to four it would drizzle, but below three it would not drizzle. I have therefore taken off,

in order to make it perfectly fair, three and a half inches as the measurement which would indicate that there would be no more than water sufficient to supply the Wamesit canal. Taking the same months, in April, 1874, there was no day when it was so low as that; May, there was no day; June, there was no day; July, twenty-four days; August, nineteen days; September, thirty days; October, thirty-one days; November, thirty days; December, thirty-one days; January, thirty-one days; February, twenty-three days; and March, one day (that was part of the time when the city were taking this water); in all, 221 days, or seven months and eleven days that there was so little water running in that canal that

we lost the whole of our twenty-two per cent.

Then I come to April, 1875, and there was no day when the water was low enough; May, there was one day; June, fourteen days; July, twenty-eight days; August, twentythree days; September, thirty days; October, seventeen days; November, twelve days; December, seventeen days; January, sixteen days, February, seven days; and March, three days; making 168 days, or five months and eighteen days; so that we lose the full twenty-two per cent. seven months and eleven days, between April 1st, 1874, and April 1st, 1875, and five months and eighteen days between April 1st, 1875, and April 1st, 1876; and certainly I shall be justified in taking the average of those two. The winter of 1874 was rather dryer than usual, and the city was taking some of the water, and in 1875 and 1876 it was rather wetter, perhaps; taking the average would give us a little over six months. These conclusions are supported by the use of the water on the Wamesit canal, by the limits of the use made of it. The mills not owned by the Wamesit Company are entitled to 220 feet a second, and every man's flume has been inspected, so that he can draw no more than that. They may get more than their proportion when the water is beginning to fall off, but I don't know whether they do or not.

Mr. Butler. I don't understand it to be so.

Mr. Shattuck. Well, leave it all out; I don't attach much argument to this. I merely put it in for what it is worth. It is simply an answer to any attempt by the other side to show that there is a much larger flow in the river, by showing how much power is used. The mills not owned by the Wamesit Company are entitled to 220 feet, and the guaranteed horse-power is 207, which requires about 323 feet per second. They went over a large number of mills; they made it 207 horse-power, you will recollect; of the guaranteed mills they stated there was some loss from friction,

and from the fact that the mills were not on a straight line. I have not taken that into account. Whatever that amounts to is to be added. I say the power the company has sold and guaranteed would be provided by 323 feet of water; but you are to credit the Bleachery, which does not use over eight feet of water out of thirty-six in any ordinary times, with twenty-eight feet. The Belvidere has not been running. For that credit twenty-seven feet, and we have fifty-five feet to be deducted from the 322, which leaves 268 feet, which is the amount which they have been using there the past year. Then you are to add something to those mills above, which they let without guaranteeing. But this is all they see fit to guarantee. They practically found it would not do, I suppose, to guarantee anything more than that. After crediting the mills which are not running, and deducting that from the gross amount, it brings it down to about 268 feet as the amount which they are using when steam is not used.

I think I have given the best evidence which has been furnished, to show the actual amount of water running in Concord river, and how much of it we are to lose; and it appears from this that for nine months, about, within a few days of nine months, we lose some part of the power to which we are entitled. We do not lose it in any six months which we can count upon, or during any week that we can count upon, and there is no month in the year during that period when we did not lose some power. One year we didn't lose anything in May; the other year we didn't lose anything in April; but from January 1st to the last day of December, year by year, we are liable any day to suffer by this taking. Of course if there is high water we are reasonably certain for a few days that we shall not have to furnish There is no week or month that we are safe against this loss of power, and we must therefore provide for it, and the question is, what will it cost us?

Upon this question I have already stated generally the view which we take, and which the evidence supports. A provision must be made which will enable us to provide as a prudent and reasonable man will provide for the contingencies, and that cannot be shown more clearly than by reading a little of the evidence of Mr. Stott and of Mr. Farring-

ton: --

John Stott, page 676. "If we have got to get up steam at all to run the engine, it makes no difference in the expense of fuel; that is to say, it costs as much to make a fire under the boiler to make steam for that engine, not knowing how much we would have to use it, as it would if we were to run all day."

It takes nearly a ton of coal, more or less, to fire up and start the engine. He also says if they get up steam at all, whether they need one horse-power or five horse-power, that it costs them as much as it would to run twenty horse-power nearly the whole day, because the fire must be built and the machinery started, and you cannot start it without substantially that expenditure.

Then again I have the evidence of Mr. Farrington. The

question was this, on page 753:—

"Q. You would say it would be as cheap to run the twenty horse-power all the time, if you had to furnish it reasonably often?

"A. Yes, sir; I should run it constantly for the reason (if you desire to know that) that in a steam-engine under such circumstances, if it be properly fitted up, the exhaust steam is used,"

etc.

That is his reason, and that is a matter which I shall consider presently by itself. In all the questions, and I don't know that there will be any controversy on this point, put by the city, they assume that the question was one of twenty horse-power, that being the smallest that can be furnished practically with such an engine as it would be necessary to put into these mills; and Mr. Farrington estimates that to furnish the Sterling mills with twenty horse-power ought to cost \$1,500 a year. I put this question to Mr. Farrington, page 751:—

"Q. Don't you put in nearly as much coal and fuel to start a fire with for twenty horse-power, as if you were going to have 150 or 200 horse-power?

"A. Not quite as large a difference as that."

I assume, therefore, gentlemen, — and I shall proceed on that assumption, — that, if we furnish the steam-power, we must provide for at least twenty horse-power; for, if it is necessary to use it any part of the day, and you begin in the morning and use it an hour, you may have to use it another hour at the end of the day. You cannot tell whether you will have to or not. If, therefore, it is necessary to use the power at all, — or, to go one step further, if it is so probable that it will be necessary to use it, that a prudent man will provide for it, — you must pay us for twenty horse-power. Nothing less will compensate us. That is the uncontradicted testimony of those two witnesses. Mr. Farrington thinks that an engine of thirty-five or forty horse-power would answer for us. The others put it larger — forty or fifty horse-power.

And as to this class of evidence, I wish to say that, after reflection, I did not think it necessary, where the evidence was plain, to introduce cumulative testimony, because the commissioners have experience, and no doubt on this subject are just as well instructed by one man who states the truth as they can be by a dozen; and when Mr. Stott comes here and states the exact working of this auxiliary steam-power, what the cost is to them as proved by experience in a mill which has been running about a month in a year up to this year, and, except in case of freshets, nearly all the time during the last three or four months, — when he states that experience, and nobody comes up here to contradict it, and the only witness the city introduces here confirms it, we have a right to rely upon it, and I shall, therefore, assume that nothing less than the cost of twenty horse-power will provide compensation for the injury which is done us. course the question whether we are to introduce steam or not is a practical one. You are to give us compensation. If we can have compensation in any less expensive way, reasonably we have no right to claim anything more, but practically all these mills at Lowell, as the evidence shows here, are running to the full extent of their power, and every one of them has gone to the extreme verge of its power, and any change in that power will require them to introduce steam. Some of the mills have done it already. The Belvidere No. 2 has never used it. It bought the engine because they expected this taking of the water, but they stopped for financial reasons and have never used it. put it in here for this purpose, solely for this reason. There is no doubt the other mills will do it. They have never practically gone to the Wamesit Company to buy power of them. They found it advisable and expedient to put in their engine, and there isn't any doubt whatever that, at the moment when this water is taken, and when this is settled, that all these mills must put in engines, and that is the practical measure of damages; and every one of them will run just as the Belvidere No. 2 runs, with a forty or fifty horse-power engine, and will expend for it, when they use it at all, the full cost of twenty horse-power.

Now I come to the question of what twenty horse-power is worth, and I suppose I should be safe enough to leave that question without any discussion. The exact loss of power in the Sterling mill, taking away twenty-two per cent., would be 15.64 horse-power. The exact loss of power in the Belvidere mill would be 11.88, and the evidence, as I have already said—and I will not repeat it—shows that they cannot

make that up without using twenty horse-power, and nobody contradicts it practically.

Mr. Butler. A twenty horse-power engine?

Mr. Shattuck. Oh, we shall have a forty horse-power engine, but we have to pay the cost of twenty horse-power. In order to make it available we have to furnish twenty horse-power.

Mr. Butler. I wish you would read the witness's testi-

mony.

Mr. Shattuck. Whose testimony?

Mr. Butler. Anybody's who testifies that you will have to use a forty horse-power engine in order to get up twenty horse-power.

Mr. Shattuck. Well, I shall have to use your own witness, Mr. Farrington. Mr. Farrington says that exactly,

word for word, — thirty-five to forty horse-power.

Mr. Butler. The point exactly is this, Brother Shattuck: it is more convenient to have a forty horse-power engine, and perhaps more economical, but you don't have to get up twenty horse-power in order to use fifteen.

Mr. Shattuck. If that is intended to aid me, I am obliged to you; if it is intended as a statement of fact, I

say it is contradicted by the evidence. That is all.

Mr. Butler. Pardon me; that is my understanding of the fact as testified to, if testified to at all, because nobody would have testified to that unless it was a crazy man.

Mr. Shattuck. It is the testimony of Mr. Farrington, and of Mr. Holmes too, that there was a margin necessary,

and it has not been contradicted either.

Mr. Butler. But that is a margin of engine and not a

margin of power.

Mr. Shattuck. Oh, I beg your pardon. I will read you a little, if you don't recollect, in regard to that. This has not been contradicted by anybody: "I should put in, if I wanted to furnish twenty horse-power as a maximum, as auxiliary, perhaps an engine of from thirty-five to forty horsepower as a safety." That is Mr. Farrington's statement. Now I wish to read the evidence which I think is not only uncontradicted, but which, I think, seems to commend itself to good sense to such an extent that I read it with entire confidence that it will be accepted: -

"Q. Practically, how much steam is required when you are using the smallest amount?

"A. If we have got to get up steam at all to run the engine, it makes no difference in the expense of fuel; that is to say, it costs as much to make a fire under the boiler to make steam for that engine, not knowing how much we would have to use it, as it would if we were to run all day.

"Q. Can you illustrate that by any instance within a day or

two?

"A. Yes, sir. One instance yesterday. Day before yesterday the water was in such condition that it appeared that we should be obliged to use steam, and the order was to get up steam to run the engine, and we had a fire on purpose for steam for the engine; and I think they ran it an hour and a half or two hours, and then the water came, so that the engine was not wanted.

"Q. How much coal do you use?

"A. Well, it takes somewhere in the vicinity (not having the exact figures) of a ton of coal to start the fire and run the steamengine.

"Q. If you wanted twenty horse-power for all day, how much

more coal would it take?

"A. No more at all. We should not have to get any more fire.

"Q. Practically, then, if you have to furnish any auxiliary power, you must use fuel enough to provide pretty large power—is that so?

"A. Yes, sir.

"Q. And if you have to provide it for any part of the day, you

must provide fuel enough substantially for the whole day?

"A. Yes, sir, substantially speaking, the whole day. You can't tell when the water is going down, and, unless you want to stop the machinery entirely. You must have steam to take the place of the water, and to do that you must have fire under the boiler.

"Q. Could you tell practically any day this last summer, with a few exceptions, in the morning, whether you would need steam all

day or not?

i'A. Well, yes, we know as well as we can know anything that is to come during the day, that we wouldn't need it all day. Well, there have been times, especially during this year; we have used the steam probably more this year than for a number of years past. We have hardly put the water-wheel on at all; sometimes scarcely drawn water enough in the morning to do the pulling at times this year."

Now, I do not know how there could be a more clear and explicit statement by a witness of large experience.

Mr. Butler. As book-keeper?

Mr. Shattuck. Manager of the mill, born and brought up in a mill as a hand in it, and manager when the superintendent is away. This man states it fully, and I don't care to argue it, because it is so clearly reasonable and fair, and it is practically Mr. Farrington's evidence also.

I now come back to the question from which I was diverted. Say that twenty horse-power must be furnished whenever there is any deficiency of the water, so that we are obliged to furnish steam at all for any part of the day, and

I ask again, What is steam worth? There is a legal principle, familiar to the chairman of this commission, which throws light upon this question. Suppose the city had taken a wagon from my clients in this case, converted it, and a suit was brought for the value of that wagon, and we should put in evidence of the market price, it would not control that evidence if the other side should come up and show that by going to a particular place and buying the lumber, and getting this man to make it and another man to paint it, we could furnish such a wagon as that for a lower price, because the good sense of the courts has determined, and it has been the rule of law for a century, that, on the whole, the best test of value is the market value; and the court would instruct the jury in the case of the wagon that it is the market value, the price the minds of men generally meet on, which is to be paid, and not what one, who may be a little sharper than anybody else, or more economical, or more vigilant in his business, can construct it for. Upon the same principle, in this case, when the question is, What is it worth to furnish steam-power as an auxiliary? the best evidence is what people are willing to pay for it. Usually it is sold to tenants by parties who furnish it with the view to securing the rent of the premises that are occupied, so that it is furnished at a low rate. The testimony of Mr. Frizell is, that where you are furnishing a margin of steam-power, as in this case, of a small amount, that \$150 a year for each horse-power is a fair. price for it, and that it is sold here in Boston where coal is cheaper than it is in Lowell, from \$150 to \$200; and that is also the testimony of other parties. In Lowell it is sold from \$100 to \$125 per horse-power, not as a margin, as I understand it, in any case, but simply as a fixed amount where it is to be furnished regularly. I shall assume, until there is evidence to the contrary, that \$150 is not far out of the way; but you know this, gentlemen, better than I do, and as well as any of the witnesses. It is useless, before you, gentlemen, to discuss this question; but there are one or two considerations which I desire to call to your attention.

In the first place, it has been urged here that we are not entitled to any profit on this steam. What is a profit? It simply represents a fair income of the capital invested for the purpose of furnishing steam. If we put in a steam-engine and allow for depreciation, then the profit represents the interest, that is all, larger or smaller, according to the risk involved. For a steam-engine it should be a pretty high rate of interest,—not twenty per cent., which my brother Child suggested,—but a fair rate of interest. We will

take half, compromise on half even for a steam-engine; but there is some profit or interest to be allowed on this business that we must do in furnishing steam, which we don't care to embark in, but are compelled to embark in, and therefore we are entitled to fair interest.

Mr. Butler. After we buy the engine for you and pay for it and fix it, do you want us to pay any interest on that?

Mr. Shattuck. That involves the whole question. We are trying to find out what capacity ought to be put in. We have to pay out the money to begin with; we must pay out our money; we must lose the interest on that money; we must invest in coal, in men, in everything else. Of course the amount which we shall ask for from the city is enough to cover all those sums. We don't ask for anything more than that.

Mr. BUTLER. If it will not interrupt you, I would like to ask you to take it in the case of the Sterling mills. What is your claim? What do you think it is?

Mr. Shattuck. I will come to that. I am stating the principles and the evidence. You will have it before we get through, General. I am discussing now the question of the cost of steam-power. They say there is no profit to be fur-

nished; it is to be furnished without any profit.

In the next place, to contradict this evidence of the market value of power and what it costs, they bring in here the general chief manager of the Wamesit Power Company, who sells water with a small margin of steam for \$75 a horsepower, and a large interest on the land and buildings besides. Now I always supposed that steam-power was worth twice as much as horse-power. If they get \$75 per horse-power out of the whole, what ought to go for water and what ought to go for steam? I don't think you will find that the Wamesit Power Company is furnishing steam at a much less rate than we contend for. Mr. Farrington, who is, it must be borne in mind, constantly in litigation with our clients here, and who seems to believe that they have been stealing an excess of water for years, comes here with that natural prejudice against wrong-doers which we should expect under the cir-His testimony, in the re-direct examination by General Butler, is much in conflict with his direct testimony and that given on cross-examination. It will be for you to read it over and see; but it is a little singular, I submit, that Mr. Farrington should find out that his steam-power costs him exactly what he is selling his horse-power with a margin of steam for, the exact figure; that he should sit down and make an independent calculation of the cost of steam, and find a fair value for us, is exactly what they are selling this

water and steam-power for. It confirms what my brother Storey on cross-examination seems to have suggested, that he must have taken the \$75, and then made his figures to suit the amount. Now, let us see how he makes up his \$75. In the first place, how much coal does he allow for? Three pounds per hour for each horse-power. Now that is all very well theoretically. You will see engines advertised to furnish in small amounts horse-power for three pounds of coal per hour, and by measuring every ounce of coal for a day you may get the power at that rate; but there isn't a manufactory in the Commonwealth who has the experience of a month in such matters who doesn't know that steam-power, as you use it in mills, with engines as they go, in small quantities, takes from five to six pounds of coals per hour.

Mr. BUTLER. I don't see that the hour has anything to do with it. In making your fire in the morning you could run

as cheap all day.

Mr. Shattuck. I am coming to that in a minute. Now how much coal does he allow us for a year? To come within his \$75 as Brother Storey suggests, he must get his coal down low enough; and he allows us ninety tons for a year of 313 days. Now Mr. Stott says it takes about a ton of coal a day to run their engine for almost any margin which they are required to use to supplement their water, which would be over three times as much as Mr. Farrington allows in his estimate, or about three and a half times, to be more exact. Then, again, I do not care to go over the testimony which has been introduced in the other cases. Take the estimate of steam-power by Mr. Holmes made in the Talbot case, the estimate of Mr. Bacon in the Saxonville case, who makes it for a very large amount of steam-power (and this evidence was not contradicted in either of these cases), and you are bound, if you decide these cases by the evidence, to decide them upon the theory that steam-power costs from \$125 to \$150 a horse-power. Yet the city comes in here, with Mr. Farrington, the employé of the Wamesit Company, the natural enemy of all our clients, who fixes it at \$75 per horse-power.

Well, then they tell us, or Mr. Farrington does, that we must use our exhaust steam; and under some circumstances, and in some mills, I do not doubt that they do use exhaust steam to advantage. Our witness says they can use it for certain kinds of coloring, but in our mills where they use the scarlet dye it is impossible to use the exhaust steam. They have tried it and abandoned it; and so also for washing wool and for heating purposes. I do not understand what Mr. Farrington means by two pounds back-pressure,

but they require thirty pounds pressure for heat, wool-washing and dyeing, and when you have that back-pressure on an engine you will see how that practically reduces the power. They don't use exhaust steam in the Stott mills; they find it cheaper not to do so.

Mr. Butler. Won't you read Mr. Mills's testimony? I don't want you to bear down too hard on Mr. Far-

rington.

Mr. Shattuck. I am very happy to read it: —

"Q. Suppose you confine yourself to my question, and leave other matters out: we shall get along better, I think. I want to get your judgment. My question is this: What, in your judgment, from your calculations, does it cost a year to make a horse-power of steam,— the engine being already prepared, a portion of the boilers being heated, and an engineer and fireman to attend to a portion of the boilers?

"A. I haven't the calculation here; but, from what data I have here, I conclude it would be not far from sixty dollars per

annum.

"Q. How many pounds of coal per day per horse-power?

"A. I haven't got all my data here for the calculation, but this

will give you some idea.

"Q. My question was a very distinct one, Mr. Mills: How much coal it would take per day, or any other time, per horse-power?

"A. When their engines are in good condition, they use about three pounds of coal per hour per horse-power, at about seven

dollars a ton.

"Q. Is that a day of ten, twelve, or fifteen hours?

"A. Ten hours.

- "Q. Thirty pounds a day, three hundred days a year, would make how much?
- "A. Nine thousand pounds; at seven dollars per ton, that would be thirty dollars for coal. I think that is about as low as they get it.

"Q. Now, then, how much for oil?

"A. I cannot tell. I haven't got any figures here.

"Q. What other items did you put in, sir?

"A. The engineer and fireman.

"Q. How much do you make a day for them?

"A. For a hundred horse-power engine, I suppose it would be

about fifteen dollars a day.

"Q. Would it cost any more for a thousand horse-power engine than it would for an engine of a hundred horse-power? Wouldn't an engineer tend one as well as the other, if it was a good engine?

"A. You want a much better engineer.

"Q. A competent engineer could tend one as well as the other?

"A. Yes, sir; what I intended to say was, fifteen dollars per

horse-power per year. That is, fifteen hundred dollars per year for a hundred horse-power engine.

"Q. That would be five dollars per day for the two?

"A. Yes, sir. "Q. What else?

"A. There would be the depreciation of the engine from the

running, and the wear of the boiler.

"Q. Now, as an engineer, I will put you this question: Which do you think would depreciate the most,—an engine standing still or running?

"A. There is more wear running than standing still.

"Q. I know there is more wear; but which would depreciate the most in your judgment, — an engine standing still three years or running three years?

"A. An engine running.

"Q. How much?

"A. I cannot tell you.

- "Q. Now, will you tell me whether this engine is used most by the Pacific Mills when the water is too high or too low?
 - "A. When it is too high; that is, when it is too high below the

mills; when the fall is the least.

- "Q. When it is too high below the mills, it is generally too high above them, is it not?
- "A. No, sir; the water is kept at a constant height in the canal.
- "Q. No; the water in the river is higher when there is a great flow of water?

"A. Yes, sir.

"Q. (By Mr. Merwin.) Your estimate assumes that the steam-

engine is already put in, with all the appliances?

"A. No; there is no assumption of anything. The question is, how much this twelve dollars a day would amount to per horse-power per year.

"Q. And you say it is equivalent to sixty dollars a year on the

shaft, and about forty-five dollars indicator power?

"A. Yes, sir.

"Commissioner Francis (to Mr. Storrow). This is not in-

tended to be the cost of a steam-engine?

"Mr. Storrow. No, sir; it is intended to show that the cost of steam-power is above that; that a man will pay that for water-power when he has a steam-engine in."

That is the exact question; and they say if a man has his steam-engine in and has his machinery and everything else, fireman, etc., that they would rather pay \$60 a year for water than run that engine, and that too when they have an engine of a thousand horse-power. Now, if there is any other piece of testimony, I shall be much obliged to you if you will call my attention to it.

Mr. Butler. I don't think of any other piece of

testimony.

Mr. Shattuck. Now, I say that we are entitled to each of these mills, to furnish twenty horse-power for nine months at \$150 per horse-power, which is equivalent to \$2,250. wish to have the commissioners understand that \$150 a horsepower is the fair market value of a margin of steam; and taking the price at which the Essex Company sell their water as the value of the water, the Wamesit Power Company gets to-day \$150 for every horse-power of auxiliary steam that they furnish. Taking the market value of water anywhere, and take the testimony of Mr. McDaniels, to show how much of water and how much of steam they furnish in a year, and you cannot escape the conclusion that they get fully \$150 for it, the steam-power. But the commissioners know better than any of these witnesses what is a fair allowance for this steam-power, and whatever is allowed by them we must accept, and shall do it cheerfully; but upon the evidence \$150 per horse-power is not too much. If we have \$2,250 a year, we want a fund which will secure us that. At what rate shall we have it? Make such deductions as you think proper. I put the \$150 as what seemed to be the fairest upon the evidence. If a deduction is to be made from that, you will make it. We want a fund as safe as the guaranty of the City of Boston. We want a fund secured for all time, or, if my brother Child prefers it, as long as the mills are to run, which is an indefinite period and which is practically for all time. I have no doubt any fund which these parties have will be lost by bad investments before that time. But we want a fund, I say, as safe as the guaranty of the City of Boston, and five per cent. is all we can hope to realize from it by any investment. This rate was suggested by the counsel on the Talbot dam, and I don't recollect that there was any objection made to it. There was a suggestion however, - my friend suggested twenty per cent., and if that is a fair rate we ought to have twenty per cent.; but by this you are not to understand that my clients pay any such rates as that, or that they ever expect to get such rates.

The fund required at five per cent. would give us on each of those mills \$45,000. It will be suggested that is a large sum on those mills; but I say it is not an unreasonable sum. Here were two mills running and doing their business with water; the mills were constructed and adjusted with reference to that supply of water; the margin of profit in this manufacturing is, and in future years is likely to be, small; the introduction of this element of expense into that mill changes its whole character. If that mill were to be sold to-morrow, any man would naturally say, "You must have a steam engineer and a fireman, and the risk of fire and all the inconvenience at-

tending it, and the cost of coal and fuel, and we will not buy it." It is a serious, almost fatal blow to these mills to be obliged to put in this costly and inconvenient instrument to furnish them the power which they have hitherto had without any such aid, and it does affect the character of that mill to a very great extent. I have not gone into the question to cipher up here how much the building would cost, and the engine would cost, etc.; and I think it is safe in the long run, and it is also in accordance with the established legal principles, to rely upon the market price of power, because that shows better than anything else, in the long run, what it actually costs.

Now as to the Sterling mill, we have only thirty-nine years' use of it, and I presume that we are entitled to somewhere

about ninety per cent. of the total damage.

Mr. Butler. Oh, no. How do you make that out?

Mr. Shattuck. Well, according to Mr. Child we ought to have the whole of it. The point is just this. I didn't suppose there would be any controversy about it. The reversioner is entitled to a fund which after accumulating 39 years, or to the end of the lease, will cover his damages. I think that will give him about 10 or 12 or 16 per cent. of the whole damage. The interest would be compounded.

Commissioner Russell. Five per cent.

Mr. Shattuck. I leave that to the commissioners, as I do everything else — whatever is reasonable. The Belvidere, No. 1, has a cloud on its title yet, and I will make my argument on that when I make my closing remarks.

ARGUMENT OF HON. D. S. RICHARDSON.

Gentlemen: — When I came down in the cars this morning, a gentleman whose opinions are always entitled to respect, who is disconnected in every way from every question involved here, remarked that probably this commission, without the labor of these hearings, would have gone on and found out the facts and investigated this subject and come to a just and satisfactory conclusion. This remark was highly complimentary to the weight that this commission carries, and to me it had a suggestive force in another direction. Had the matters been submitted to the commissioners to investigate and settle, it would have involved an amount of labor and inquiry that to them would have been exceedingly burdensome, and therefore I suppose that there could have been no better way than that which has been pursued here, that the parties, with their counsel, should place before you all the facts which they could gather bearing on the case, and relieve you from the burden of hunting up facts. But here the remark of the gentleman comes in with suggestive force to me. We have discharged that duty, our clients and their attorneys; we have furnished to you all the evidence on either side that could be furnished, and all that remains now is to see what weight should be given to that evidence, and what conclusions should be arrived at therefrom; and there the admonition is true, that I must be cautious how I assume that I can be of great assistance to gentlemen who are, from the occupations and experiences of their lives, much more skilled in most of the questions that arise here than any lawyers could be. I don't therefore propose to go over again with any substantial part of the great mass of evidence that has been put in here and has been discussed, from different standpoints, by so able counsel on both sides.

There are two classes of evidence which have been submitted to you for your guidance; one is that which is derived mainly from science and skill, best understood by scientific men; the other is that which is derived from observation, which is common to everybody, and which every well-balanced mind can come to some conclusions from. I don't propose to touch to any extent upon much of the scientific testimony, which furnishes, from short periods of time, conclusions for long periods of time. To my heart's content I have read and re-read it, and the conclusions I might come

to, looking at it as mere matter of evidence, have not in each case, under apparently similar circumstances, come to the same results. Therefore I say that I don't confine myself to scientific men, who have furnished limited observations, in some cases leading to conflicting results. Many of these measurements may be exceedingly valuable in the line of their profession; to me, as counsel in aiding you in coming to an award, many of them seem of no substantial value, and I don't believe they will be of much importance to you when you make up your conclusions.

The questions involved here are questions of great peculiarity. Ordinarily in litigations where you sit in judgment upon the matters before you, you have evidence approaching very near to demonstration; you have evidence approaching very near to the transactions that you are to pass upon. In this case much of the evidence is exceedingly remote, and your results, within certain limits, are to be inferential.

Now, I shall deal with few of the questions of law, because they have been over and over again argued by both sides, and I don't believe that I could add anything to any of these questions, nor do I believe that a good many of them are of any importance at this stage of the proceedings. I do not propose to deal with the scientific evidence in detail, but I shall deal with that general evidence which, it seems to me, after all, you are to be governed by in coming to your results.

By a power which the sovereignty exercises, and which cannot be exercised without compensation to those injured thereby, this Commonwealth has said that a stream which otherwise would have passed through a large portion of the County of Middlesex, which for years has passed uninterruptedly through that county, upon which men have settled, upon which men have erected their dams and mills, the water of which they have converted into power, and where their property is established to give them the income, along the Sudbury and Concord rivers to the waters of the Merrimack, — the Commonwealth has said that these industries, established over years of time, shall be broken up, because a higher demand for that water is established, a justifiable demand to take it for other and different purposes than for what it has been appropriated; and the Commonwealth says, what it is obliged to say by the common compact under which we live, that everybody injured by that diversion shall be paid. And in this connnection I didn't understand the discussion of Brother Child in his argument upon the doctrine of riparian proprietor. I don't think it has the least pertinency to these cases. It is certain that

every one who has any land and any water coming from these sources to that land which he has or can utilize, and which gives him a value, is provided for in the exact words of the statute, and no technical legal discussion, as to whether he owns as riparian proprietor or whether another owner on the other side might prevent the diversion, can come in here. The legislature has fixed in distinct terms what the rights are which may be taken, and have determined that there shall be damages paid therefor; and I call your attention to the case in 3 Cushing, 107, Parker vs. The Boston and Maine Railroad, where, in almost similar language, the Court have defined what damages may be recovered. Under the language provided in this case, every railroad shall be liable to pay all damages which shall be occasioned for laying out and making and maintaining its railroad. In these cases the provision is, that they shall pay all damages that shall be sustained by persons in their property. Now, in the case of the 3d Cushing, a well on a neighboring man's land was dried up by reason of the construction of a railroad near, and the Court say substantially, whatever the rights at common law may be to underground streams, that, when the legislature said there should be compensations for persons injured, they meant that every injury done to their property, not only water above ground taken and appropriated to mills, but water under ground, that nobody knows where it comes from or where it is going to, and in that case damages were allowed for drying up a well on a lot adjoining the railroad location. So that here the statute meant to give everybody having property that had a value, irrespective of any learned discussions of riparian rights, a compensation for its injury.

Now, in these cases the water is taken at a point a great many miles from the place where the injury is done by keeping it away, and there can be no certain evidence that will measure the injury, but I think there is evidence so near that you cannot err much in dollars and cents by regarding it. I think if in fixing a measure of damages for all time you resort to evidence of occasional measurements, of occasional observations over short periods of time, and rely much on them alone, you might be led to wrong conclusions. But when you take the one great established rule that has been found correctly all over our rain-bearing territories, to give over a period of years substantially correct results, you have got a rule fixed and permanent, and a very sure guide to you, and that rule is, comparing the water-sheds and the rainfalls at the sources and supplies of the rivers.

Now, my friend, Mr. Shattuck, said he was contented with

taking 222 as the relative proportion which the waters of the Sudbury river bears to that of the Concord river. I think it exceeds that. It is perfectly certain, upon any calculation of the proportion of the Sudbury river to the whole amount in the Concord, you have a little over onefifth supplied by the Sudbury river. That water and the Concord has got to supply, before it gets to the Wamesit dam, a considerable proportion of its amount for evaporation, and to fill the territory through which it passes. Now, if over one-fifth of the water is proved by the water-shed and rainfall to have come from the Sudbury river, it don't lessen one bit, if you take it all away, the evaporation and land supply that you have got to have in what remains. That has been said by one of the last witnesses to be quite a considerable item. So that if you reckon it only $\frac{22}{100}$ it seems to me you come under rather than over the proportion of water that you have taken away from Wamesit dam. You take over one-fifth, but you also require the waterowners to supply just as much evaporation and just as much supply to the lands with what is left as you did before, so that the Sudbury water would have all gone to your dams had it not been taken away.

Assuming, then, that it is over one-fifth that is taken, let us see, so far as my clients are concerned, the situation of

their property, and the injury it does to them.

Now, you have got in these cases, in some manner, to fix a quantity of water at the Wamesit dam, which you are not called upon to fix at any other place on the river. rights of these parties are such that you cannot reach them unless you estimate certain quantities of water at certain times in the river at that dam. Well, now, how can you estimate it? You have got six weeks of measurements of water by skillfulness, in the dryest time for twenty years, from which to draw conclusions. You have got observations made at sundry times, and under peculiar circumstances at certain seasons of the year; you have got the quantity of water that starts from its sources; you have got the water-shed and rainfall that supply them: all these things you are to take into consideration. There is also a practical piece of evidence here of great importance, unless some of these things militate against and destroy it.

As long ago as 15 years, this canal had but little power used upon it. The time having arrived when the water-power was going to be useful and valuable, the owners divided up that power, which could not be used together, into portions, and sold it for use. What was the amount arrived at that that river would enable manufacturers or

those who desired to use water-power, to obtain during the year? 288 feet was the amount that the owner established as the substantial supply of the river, and he has cut that up so that where there was no building, no wheel and machinery then, it has been parcelled out and used on the basis of that quantity for 16 years. They planned that that was substantially the supply there. I say, that in the absence of any evidence absolutely controlling it, it is strong proof to your minds that the division made 16 years ago is substantially correct, and that the supply during, at least, most of the year will be that amount. I admit that you have a right, and perhaps it is your duty, to qualify all such conclusions by any measurements of a shorter period of time, and the circumstances under which they were made, giving more or less weight to them. But supposing we take the measurements made during the summer, we find that the lowest, possibly with one or two exceptions which amount to nothing, that is, the minimum on which you can always calculate, is 220 cubic feet per second, and nobody has estimated that, at any time when it is of the least consequence to the owner, it has ever fell below that. When we have 288 cubic feet supplied to us we lose nothing by what is taken away. If you give any importance to the measurements made during this dry season, that the lowest point would be 220, I shall not undertake to show you where you would arrive at between these points as the average supply, because you will be better able to do it than I shall; but somewhere between 288 as the highest and 220 the lowest our water is, beyond all question, supplied to us during the whole year, and this is applied to periods before the diversion of the Sudbury. Now, if you take 288 cubic feet a second for the whole year, and take the diversions made of the water, and could establish that for the whole year, the per cent. which I agree in adopting with my learned friend here as the correct one, then if you find no more than the 288 cubic feet, you would have no difficulty in coming to a conclusion in these cases by actual mathematical calculation; because, if there were 288 cubic feet and no more during the year, and the Sudbury river takes 22 per cent. of that, then the result is that we have lost substantially, Mr. Wood 5.28 horse-power, Faulkner 11 horse-power, and the Bleachery 15.44 horsepower, if I have made my calculation right. You will know if I have made any error, because you see the way I am endeavoring to illustrate my position here.

Now, I say, taking the evidence as it is, somewhere very near the whole amount provided for in the river runs there almost all the year. It is conceded that for three months so much more runs over the dam that we mainly during that period of time have our full amount. For nine months in the year the water does not run over the dam, and for that nine months the Sudbury river has taken from us one-fifth plus 2, ²²₁₀₀ of our power, deducting therefrom so much as you shall find the water for any period of time fall below the 288 cubic feet a second. Well, now, I don't know what rule I can point out to you that has not been pointed out over and over again by the several learned counsel who have spoken in these cases. I can apply the rule, assuming certain conditions, and so far as the conditions vary, so far it will change your results.

Now I will take first Mr. Faulkner's mill—

Mr. Butler. Before you go from that I want to ask you something. I assume that you will agree with me that the rights of these parties are to be calculated according to their deeds, without any deduction being made in favor of one or in favor of the other on account of any supposed taking of water?

Mr. Richardson. Oh, that we agree to. The question has always come up; it will never fail to come up in the world even where only two men have the right to take each an equal share of the water, because water cannot be divided in its use equally. I noticed, in looking over Mr. Storrow's account of the difficulties there at Lawrence—the pattern city—with pattern water-power, that the very first difficulties he had after selling out definite portions out of a gross amount of water were that disputes began to ensue, and the owners of the water-powers found difficulty in not exceeding at times the proportions they were entitled to use.

[Adjourned till 9.30 A. M., Friday.]

FRIDAY, October 27, 1876.

ARGUMENT OF HON. D. S. RICHARDSON, continued.

Gentlemen: - At the adjournment, I was about placing before you some figures and calculations to form a startingpoint by which I might argue certain propositions in this case. It is quite easy to argue matters generally, to establish theories, and to give a direction which you must pursue to arrive at certain results. But in these cases, while, as counsel, we might do this, still the more general we make our remarks the less we aid you in the duty which you have to perform. You will be obliged, when you settle these cases, to give the result of your deliberations in exact figures, representing dollars and cents, and from which there is to be no escape from complete accuracy. Now, in these cases, covering such a mass of testimony, and where there are such different views of different witnesses, and perhaps, in some respects, of the different counsel engaged in them, it would be entirely out of place for me to undertake to say, in the cases which I represent, that just such a sum, in dollars and cents, is what you ought to pay to my clients, because you will be obliged not only to make up from their evidence their awards, but half a dozen or a dozen other awards in similar cases; and all those awards must be made up by a consideration of the evidence that applies to each particular case. If I should undertake to say, in dollars and cents, just how much I thought was actually proved by our testimony, I should not, perhaps, be leaving it to you to make such allowances as the weight of testimony applicable to, and put in in the other cases, would require. So I propose to take certain facts and to assume certain figures, which, in my view of the evidence, are clearly established, and then from that stand-point to ask you to consider whether you think those figures will bear increasing or diminishing in establishing the awards in our cases.

I stated that I thought a fair deduction from all the testimony established the fact that twenty-two per cent. of the waters that flowed in the Concord river before this diversion came from the Sudbury river. I have made my calculations upon that basis. They would vary as you adopted a less or

greater ratio supplied by that river.

As to my three clients, then, Mr. Wood owns twelve cubic

feet, which substantially gave him twenty-four horse-power, and at twenty-two per cent. that would be 5.28 horsepower. Mr. Faulkner has twenty-five cubic feet,—fifty horsepower; the ratio taken would be eleven horse-power. Bleachery has thirty-six cubic feet, — seventy-two horsepower; the ratio taken would be 15.84 horse-power. Now, if the canal supplied uniformly during the year just 288 cubic feet, you would settle at once that the amount of loss was for the year just what ratio you should establish as to the water taken from the Sudbury river to the whole amount of water. I assume here that the water for the whole year is 288 cubic feet; then, one element more being fixed, you have an easy way of calculating exactly the value of the water taken. Other elements, in my view, will increase the

damage, but that will be one step in your progress.

Now, I assume, upon all the evidence, that the power to be furnished or sold there, if a man had it to deal in and sell as a power, is worth \$100 per horse-power per year. There is considerable evidence in the case bearing upon this point, but the fair weight of the evidence, it seems to me, cannot place it lower than \$100 a horse-power per year. The Essex Company at first sold their water-power at a very much less rate than the amount I have named, but everybody knows that the Essex Company, unless they could have sold their water-power and established industries near their dam, had a property that would be worth nothing to them, and they could have afforded to give away their water rather than not have had it go into the market and bring industries about them. Now their conduct has proved this to be true, because, after they had established several mills and sold them water-power at a moderate rate, they put up, as Mr. Storrow tells you, their water-power to \$75 a horse-power. My friend, Gen. Butler, shakes his head. I may have misapprehended his testimony.

Mr. Butler. That was on the north side.

Mr. Richardson. I don't care where it was. On page 100 of the report, Mr. Storrow says (I will read the question and answer): —

"Mr. Butler. I object; because this was after the act author-

izing the taking of the water was passed.

[&]quot;Q. What do you charge and receive for the power per horsepower per year in addition to the rent which you charge and receive for the room occupied by the tenant?

[&]quot;Q. My question was what the Essex Company charge and receive for the power per horse-power per year in addition to the rent which they charge and receive for the room occupied by the tenant?

"A. We charge \$75 per year for horse-power, for the right to take the power from the shaft which we have put in there, exclusive of the room, of course."

So that, when the land was not worth \$50 an acre, and a dam, canal and works had been constructed, involving capital of hundreds of thousands of dollars, perhaps, they were glad to sell their water-power at a small sum; but as soon as they had attracted industries there they raised the price, in the former case getting the benefit by the increased value of their land; in the last case getting some benefit in that direction, but a fairer value for the water-power. That is the lowest estimate of any value that I have seen, in any of the evidence, of the price at which water-power was sold.

Mr. Butler. If it will not interrupt you, I will say that the difference, as I understand it, is this. I wish to call your attention to it. Where they have sold the right to a man to take so much power and apply it to a wheel, they have sold it, uniformly, on the south side, as they did at first, at \$20 a horse-power. When they put up buildings, and put in shafting and machinery, they then rented the effective power from the pulley at \$75 a horse-power. That is all the difference between us.

Mr. RICHARDSON. Mr. Storrow says: "We charge \$75 per year per horse-power for the right to take power from the shaft which we have put in there, exclusive of the room,

of course."

I suppose that implies the construction of the wheel. I suppose it implies that they have the power just as the Wamesit Power Co., just as Mr. Faulkner has it, precisely; and besides they have it to sell to persons who are going to buy land in addition thereto, and make profitable that which left for the sale of the water-power would be worth nothing.

Then we will take the evidence that was put in for your guidance as to the value of water-power at the Wamesit dam. That you will have to consider in fixing what ought to be the value of water-power. Now, so far as the Wamesit Power Company is concerned in this case, their offers ought to be taken with a good deal of caution. I understand the Wamesit Power Company to say that they are ready to furnish power at \$75, either steam or water power. Now I say that the evidence from that company should be taken with some degree of caution, because the defendants here claim, and have claimed to you, that they own all the water-power except two cubic feet per second which the Wamesit Power Company talk about supplying and selling at \$75 a horse-power. The offer to supply at a certain price was

ruled out as a measure of value, but I understand it was ruled that the fact that they supply power at that rate was to be considered in evidence here. Now, they have 68 cubic feet of water, if they have any. They let 246 horse-power, guaranteed to be paid for; they have 376 horse-power in steam; and I undertake to say, that, upon all the evidence here, they cannot create and let the steam-power for \$75 a horse-power without losing money. If it is so, nobody's experience has been given to you in this case that corresponds with theirs. They guarantee 246 horse-powers; they have 136 water-powers which they claim to use to answer to that; the balance they must supply in steam, for which it is claimed they have complete conveniences. Now, how could it be that they let their steam-power for \$75 a horse-power, if, as Mr. Farrington says, \$100, substantially, is the lowest sum at which horse-power is let by others? Mr. Farrington, when he was saying that power could be furnished for \$75 by the Wamesit Company, said that he knew no place in the City of Lowell where steam-power was furnished short of \$100. I will tell you, gentlemen, why it is. It is on just the same principle that the Essex Company adopted when they had land worth \$50 an acre, and no more, unless the water-power could be used with it. If they could sell their water-power for ten per cent. of its value, they could make enough out of the sale of their land to make it up. And, gentlemen, we have an illustration here. Mr. McDaniels says that they have forty buildings, speaking roughly, already erected and owned by the Wamesit Power Company, in which they let power, in and about those premises. Well, their price for power may well be less than it would cost them, for, were it not for cheap power, what would be the rent or those forty buildings?

Let us take an example that they have given us in their transactions with Mr. Hiscox. Let us see whether \$75 a horse-power is not a lower price than they would charge anybody else. They charged him for a little piece of land, one hundred feet one way by fifty the other, as smooth as the back of your hand, and for one little room, with no machinery, \$100 a horse-power. I submit to you, gentlemen, that when they fixed \$100 a year as the rent of a horse-power to Mr. Hiscox, who agreed to build his own building, it was a questionable division to say they divided that into \$25 for a little piece of land of that size and one room besides, and \$75 for the horse-power.

I say, then, that the whole weight of the testimony is, that the lowest possible sum that you could fix, if you were establishing the market value of water-power, would be \$100

a horse-power. I do not touch upon the question here whether you could get that power. I do not allude here to the fact that it is claimed that there is other power there which will supply that at that sum. At this stage of my argument, I only assume that, for getting at certain results in dollars and cents, as to the damage done by the taking of those powers, supposing them merely articles of merchandise, not applied to buildings and machinery. At \$100 a horse-power a year, Mr. Wood's power would be worth \$528 annually; Mr. Faulkner's would be worth \$1,100 annually, and the Bleachery \$1,584 annually. Now those sums, if these men were in the traffic, desirous of buying or selling, represent what that number of horse-powers, at \$100 per horse-power, would be worth every year, and the fair damage would be the annual interest on a principal which would pay those respective sums every year, provided, always, that their power was constant for the whole year. It is plain enough, upon the testimony in the case, that it is not constant, but at times during the year it falls short, and at times it is enough to give them their full power.

Now the evidence is, that the canal has capacity enough to carry to each one of my clients the quantity of water they own, when it exists at the mouth of the canal. I lay aside here, as I have during the whole case, the fact that in the practical use of the water they have had disputes as to the amount they ought to have, and the water has not probably been divided with very great exactness as to their rights; but I assume that that is all to be laid out of this case, because, if the water was at the canal, any misuse of it by those below, or inequality in its actual use, would not exempt the City of Boston, if they should take it before it came to

such misuse, from paying therefor.

Then, I say, some portions of the year, you will find from the evidence that these parties will obtain all they are entitled to by their grants. For how large a portion of the year? There is a dispute between the two sides, whether it is for six months or for three months; somewhere, probably, between those two periods—you will fix the exact time. I assume in these calculations that our testimony is controlling here, that for three months in the year water runs over the dam in more or less abundance, and for the rest of the time it does not. If this statement is substantially correct, then it will be, that for three months in the year they take no quantity so large as to injure us, and for nine months they take some portion of our water.

At this point I desire to submit these illustrations as applied to the water going above or below 288 cubic feet, the

quantity which gives each one his share. It is testified, from observations made for a stated period lately, as I understand, that at the lowest possible time (with an occasional extraordinary exception that is of no consequence) there are 220 cubic feet of water in that canal during twelve hours of the day. That is to say, that the lowest estimate, making all due allowances which the mill-owner need make, is 220 feet per second during working hours. For how long a period that will last, whether, it being only the result of a little over a month's investigation, in the dryest time of the year, the estimate is not considerably lower than it ought to be, you are to determine from the evidence, including that of the water supply above on the river. Somewhere above that sum there would be to us a less proportion of damage, varying as the water increased up to 288 cubic feet. But, gentlemen, on the other side, you are to look at this consideration: that when the water of the Sudbury and Concord exceeds 288 cubic feet in the canal, we are still injured, if twenty-two per cent. is taken from that, and that I propose to illustrate in this manner: 288 cubic feet per second, added to 81, which would give us our 22 per cent. of the result substantially and lower to 288, would make 369 cubic feet per second in the canal. Now, when the water stands at 369 cubic feet, which is over 700 horse-power, the City of Boston cannot divert two cubic feet without doing some damage to our rights. I will illustrate it in this way: Suppose the water in the Concord river reduced to 350 cubic feet per second, that is 700 horse-power. Now, let the City of Boston divert its 22 per cent. of that, which is 77 cubic feet, and you have, after they have taken that portion of the water, 273 cubic feet only in the canal. We had to start with 350 cubic feet; they have taken 77 feet, and have left us 273 feet, and to give us our full rights we must have 288 feet; and therefore, with that diversion of water, we have lost among us on the Wamesit canal, 15 cubic feet of water. I give you that as an illustration, that when there is 288 feet less in the canal we are not injured, but that when there is enough more to make 369 feet the city cannot take it in the proportion which it does take it without injuring us proportionally; and so on down to the lowest point that it runs in the canal.

The City of Boston is taking, when the quantity that both rivers would supply is as high as 369 feet, every day it lowers, a certain proportion from us, injuring us. When you find that there is 220 cubic feet of water in the canal per second, of course we have lost our proportion of the sixty-eight cubic feet which is not furnished by nature to the

canal, and, therefore, that not having been diverted by the city, the proportion which we lose is less, according as you establish the amount of the flow; and so, I say, when you find that there is 288 cubic feet, that is, the water standing, for instance, nine months in the year at the top of the dam, furnishes us 288 cubic feet per second, that makes our supply, if none is diverted by the city. When you find that the other three months there is considerably more than that, you will be obliged to find that there is more than 369 cubic feet all that time before the city takes the Sudbury, or else we are injured during those three months. And so I say that there will be injury when the canal for both rivers is apparently full.

Mr. Butler. I don't understand your proposition. We are not bound to compensate you when you get the 288 feet.

Mr. Richardson. No, sir. My proposition is, that it is perfectly clear, that if there is 220 cubic feet of water in the canal before diversion, we are not entitled to compensation from the city for diverting our proportion of what would be 288 cubic feet, that is, an allowance must be made to the City of Boston. In the proposition I have made here, instead of amounting to \$528, \$1,100, and \$1,584, it would be the per cent. of the 220 cubic feet, more or less, which would reduce my results to that extent. I have said that for three months in the year there is, with both rivers, 288 cubic feet per second, but it is very doubtful whether in any day during those three months so much water would run over the dam all day as to supply to the river 369 cubic feet, so that the city, even then, would be taking some portion of the water that was running over the dam, and that might, in some measure, compensate the periods when our supply is less than the 288 cubic feet.

Now, gentlemen, these figures, I have said, I arrive at by estimating the value of the water-power, were it for sale; but neither of these petitioners presents any such case as that. I propose to take them in their order, and to show you how my clients think their claim is increased over these amounts. I say nothing here about considerations in deeds, about the low rates that these powers and this land were sold at years ago, because, in my judgment, there is certain evidence here that those amounts are of no value as guides in establishing the damages here. Mr. Faulkner, it appears, in 1862, gave \$3,000 for ten cubic feet of water, the interest of which would amount to about the ratio of the Essex Company more or less.

Mr. Butler. Just exactly that.

Mr. RICHARDSON. One \$18, and the other \$20, isn't it?

Mr. Butler. The land went in at just about that.

Mr. Richardson. That is no guide, because they were glad to sell their land to have the property improved. Mr. Faulkner bought his water-power and his land. That waterpower to-day would be worth to him to sell in the market the rates I put in my table before; but in addition to that, he has built his mill, eighty-one feet by fifty, five stories high; he has put in six sets of machinery; he has prepared the whole for operation; and in addition to giving this amount for his water, he has put in all this capital. The water would be worth nothing to him without the capital, and the capital there would be worth little or nothing to him without the water; and when these people come and take this water away from him after it has been united with his capital in that manner, it does not lay in their mouth to say that they will pay him its market value; but they must pay him for the water that they have taken, and in addition thereto they must pay him the diminished value of his investment, by which he used that water. That is damage done to his property. It seems to me this is perfectly clear.

Take the case of Mr. Hiscox, to which I alluded a little time ago. He had eight horse-power, for which he gave \$800, adding a little piece of land and a room. Now, suppose the City of Boston had taken all his eight horse-power away from him. He constructed a building; he put in his works and laid out capital there. Would \$800 a year be a compensation for the value of the power taken, when the building he put there and his machinery were rendered of little value when left without power? It seems to me it is perfectly plain that the value of the water taken is not the

only element in the three cases.

Now, in the case of Mr. Faulkner, substantially eleven horse-power is taken away from him. It is not denied in this case that this power is indispensable to him to carry on the work that he has established and been engaged on there for so many years, and that just so much is his mill and the machinery damaged as you have taken away the power that he has to run it. What compensation will you give him? Not the market value of his power alone, because then, if you took the whole of it and paid him that, he would have to shut up his mill, go away, and lose all his investment. You are obliged to pay him the money value of the power, in addition to the loss of invested capital that the taking away of that power has brought about. You cannot say that he could have horse-powers of others around there, because that depends upon contracts, and upon the circumstances of the parties, and is an uncertain way of arriving at the measure of

compensation. I can see only two ways by which you can justly fix the measure of his damages. One is by allowing him for the value of the power and the damage to his mill and the machinery, assuming that the power is taken away, and the mill and the machinery are of so much less value. The other is, — and I believe in these cases that is the conclusion which you will arrive at, - that you will give him such a sum in capital that he can replace that power by steam, and can replace it so that it will not be dependent upon hiring, but will be owned by him and under his control. I do not propose to discuss the question of how much it would cost to supply steam there. You have ample means of ascertaining that in the evidence in the case. I will put in however, what Mr. Faulkner claims is what he would have to do in order to get steam-power to supply this want. is certain that the little steam-engine that my learned brother alluded to as supplying the wants there, costing four or five hundred dollars, is utterly useless for any such purpose.

Mr. Butler. What did he put it in for?

Mr. Richardson. He put it in for heating purposes, for coloring purposes, and because he was obliged to, waiting until justice pointed out to him what he could do permanently. He put it in to meet a temporary necessity caused by the conduct of these defendants, and it does not lay in their mouths to say that he should be held to that as a permanent arrangement. Mr. Faulkner claims that he should have such a sum as would furnish him with steam-power under his own control, and the cost of running it, with fair compensation for his capital. He claims, in the first place, land at the price it can be procured for, to furnish a place for engine, boiler and building, because he bought with his power only land enough to use it as he then used it. He claims that he should have boiler of ten horse-power over the water diverted, setting up, including foundation, together with safety-valve, feed-pipes, valves and flanges. He claims that he should have an engine of five horse-power over the water diverted, foundation, setting of the same, including the feed-pipes, exhaust-pipes, steam-pump, heater, clutches to connect and disconnect engine, extension of mill, mainshaft, coal, firemen and engineer. Also, a sum sufficient to pay the first cost of this steam apparatus and setting up. Then add to that a sum sufficient, the yearly interest of which shall pay for coal, engineer and fireman, and eight per cent. on cost of steam apparatus, as experts say this is only a fair consideration for wear and tear of steam ap-

In the case of Mr. Faulkner, you will find, first, what

horse-power is taken away from him, and over what period of the year. Having found that, you are either obliged to pay him the value of that horse-power, and the damage done to his invested capital by taking it away, or you are bound to see to it that he has money enough, as matters now go, to supply that power with steam in a manner to make it permanently under his control; and he cannot go on with his mill without that power, unless he abridges his machinery. What those sums should be of course will depend upon how

you find the facts in the case.

Coming to Mr. Wood, — he is situated differently from any person on this stream. It is a small power, just sufficient to answer the purposes of his business. He selected it early, when this water-power was put in the market; he constructed his mill and his machinery, for his own personal business, at a good deal of expense. It was just enough, and no more, to do his work. Now, out of that they have taken 5.28 horse-power, leaving him, at the most, not far from 18 horse-power, when the canal is full, to do a business which, at the lowest, requires 20 horse-power. They have destroyed the value and efficiency of his plant and his apparatus, and destroyed it in such manner that he cannot supply it by steam. You would hardly find that, with sixteen or eighteen horse-power, it would be advisable for him to put in steam to make up this balance. He thinks it would be impracticable, and that he could not compete with those using water-power. If you should so find, you would do it by the same calculations that you make in Mr. Faulkner's and the other cases. That matter I will leave to you. If you think he should have steam, then of course you will give him the capital that, considering how little time he will have to use it, how irregular the times in which he will have to use it, will supply what is taken from him and make him whole. If you do not do that, while you pay him in the manner calculated for the actual value of the horsepower diverted, you must look to one further and greater element of damage, to wit, the injury done to his invested capital for the purposes for which it was put there. When you pay him just what it is worth in the market to others for the water you have taken away, you have left him his mill to be run by him with insufficient power, or else to be disposed of for some other and different purposes, so that you must give him a sum that will compensate him for the damage you have done to his mill and his machinery as established there. Supposing twenty horse-power in substance would run the grist-mill, as he says it would, and it required twenty horse-power to run it, as he said it would, without his other machinery, — suppose you take away three horse-power from that twenty horse-power, the measure of the value of the three horse-powers would be nothing in comparison with the lamed use forever of the rest of the power there. He has got his mill built, he has got his apparatus fixed, and the means of taking the power and using it. And this injury would be greater and greater as the water of the canal at any period falls below two hundred and eighty-eight cubic feet. How you will arrive at that is for you to determine.

Then the next case, the last that I have at present anything to say upon, is the Bleachery. The Bleachery and Mr. Wood, as we have seen, do not at all times get the power that they are entitled to; it is equally clear that they have the ownership of that power, and that there is no reason why they do not get what they are entitled to, except the practical disputes about using it between the parties. So I say, in their cases, although they have had inconveniences in getting at their rights, that matter is to be settled between them and the parties who interfere with those rights, and the City of Boston cannot look upon that as an excuse for not paying for what they took away from them.

Mr. Butler. It is fair that I should state the view I shall take of that, that you may answer it, as nobody else is to speak for Mr. Wood, probably. The rule being the market value of the property taken, that consideration would come in, not as an excuse for the city for taking the property, but in this view: what is the value of a water-privilege for practical use when you cannot have any water? That is the point to which I wish to direct your attention. No matter whether you have the right or not. There are a great many things that a man has a right to that he does not get, and

they are not valuable because he does not get them.

Mr. Richardson. I understood the position from the very start of this case when we stood upon the dam, at the view that the Wamesit Power Company, which lets 246 horse-power, and has but 88 water-power to supply it with, had their part of the power, and none went to the Bleachery. I understood it to be claimed there that of course it was no damage to them because somebody else took the water. I think I understand the whole claim made by the City of Boston in this respect: "Either through your neglect to enforce your rights, or through your want of knowledge as to the reason why you did not have your rights, or for some other cause, the water that would supply your whole 72 feet horse-power, which exists within twenty rods of your wheels and flumes at the head of the canal, does not get down to

you." Well, I should be surprised to hear the City of Boston contend, when I have proved that the canal has the capacity to deliver the water to the Bleachery and to Mr. Wood (for Mr. Frizell says there is no question upon that, if others did not take the water before it got there), when I have proved that the canal is six feet deep, and I do not know how wide, — a canal anybody would suppose capable of carrying any amount of water required there, - when I have proved, with the other petitioners in this case, that this water, if not diverted, comes down from the Sudbury to the Concord, and enters into the mouth of the Wamesit canal on its way down to Wood's and the Bleachery — I say I should be surprised to hear the City of Boston contend that because we have not at times looked out and secured that water and the benefit of it, they will set that up and deprive us of the value of it. Such a proposition is hardly to be maintained. I do not see how any claim of that sort can be set up. What is it? You have got the power, but you have let others, in the kindness of your hearts, use it; you have not used it; you have not wanted to use it, perhaps, yourselves. have done as Mr. Wood has done, - got your power at night and at irregular times to accommodate your neighbors. But the answer to this, gentlemen, is clear and plain, that by our deed we have a right to that quantity of water at the entrance of this canal, and a capacity of the canal to deliver at our works, and because, practically, we have not used it at all times, that is no answer to our claim for damages when the city has diverted that water and prevented its coming to that canal.

I assume, then, that notwithstanding it is in evidence that at times we do not get our share of the water, we have proved to you by our conveyance that we have just as much right to that water as has the first taker on the canal, or as has the last taker on the canal of the Wamesit Power Company. And for what is it that you are to estimate damages? Damages that have been done to us for years past? No. Damages measured by the manner we have used our property? Not necessarily. What is it? It is the damages done to our property by taking away that which we have a right to claim shall go there to make that property valuable, and which would go there but for the diversion. The fact that we have not always asserted that right, — the fact that for some reason or other we have not had the benefit of it, — is no answer by the city, when they have, by the strong hand, authorized by law, taken it away so that we cannot assert it, and, therefore, they must pay the damage.

Now, what is the damage in the case of the Bleachery?

The Bleachery has put in a wheel capable of using all that water-power. They have 72 horse-power, and they have got a 75 horse-power wheel, and they have land enough. They are situated, in that respect, just as the Wamesit Power Company is as to its surplus power. What is it worth to them? It is worth to them just such a sum unused as they could sell it for, or as they could get in using it. It is power connected with a wheel, so that it can be delivered to any person who desires to use it. The fact that they do not use it for power is not to be considered alone. It is taken away from To-morrow they might be able to use it themselves or sell it. What is it worth situated as it is, -power reclaimed and ready to be used? That is one measure of value. do, however, use some of that power. They use, in connection with their repair-shop, eight horse-power; they use for the purpose of bleaching, some ten or eleven cubic feet per second — ten, I think — it is somewhere in that neighbor-They use 25 or 30 horse-power now for some pur-That, then, has an extra value over that which they have not appropriated. That gives an enhanced value to their other property. What it is worth as power is one of the elements of damage, and the additional benefit they derive from that, as in the other cases, is another.

Now, there are two other views which you must take of the value of their property. It cannot be claimed that because they do not use it they should have no pay for it. But they do use it. They have created such a set of works that every particle of this power could be used for a purpose exceedingly valuable, not only to their own works, but to their neighborhood. They have so arranged it, that any minute, with their present machinery, the whole of that power could be used for extinguishing fires over all their property, and over all the property of their neighbors. It seems to me that gives a value additional to what it would be if they had it for sale in the market only. Why not? \$300,000 of manufacturing property, situated as that property is situated, would command \$6,000 a year, more or less premium on insurance, and I submit to you if one-half per cent., \$1,500, would not be readily taken off of the rate of insurance for any manufacturing company that had apparatus connected with a 72 horse-power wheel with this quantity of water which they could use any moment a fire should occur there.

Mr. Butler. I want you to look at this, Mr. Richardson. If I understand the rights of these parties, the Wamesit Power Company, at the end of eleven and a quarter hours'

use of that water a day, could shut down their gates and leave the canal as empty as a dry bucket.

Mr. RICHARDSON. I do not argue that they have any right to use it, except for the eleven and a quarter hours.

Mr. Butler. How could they extinguish a fire, if the Wamesit Power Company kept the water out of the canal the other thirteen hours?

Mr. Shattuck. Mr. Richardson is considering the river

as it runs, practically.

Mr. Butler. Practically, we should do that. After they have taken the water eleven and a quarter hours, they must stop. They have a right to use it eleven and a quarter hours as much as they want to. If you say every man on the canal gets an interchange, that will not do, because we can shut every man's mill down, except for eleven and a quarter hours.

Commissioner Francis. The time, eleven and a quarter

hours a day, is not fixed in the deed.

Mr. Butler. My idea is, that the rule of law would be the ordinary working-hours of the day. I have no doubt of it.

Mr. Richardson. I do not claim that they would have a right to use, for the purpose of extinguishing a fire, any more water than is granted to them by their conveyance; but if twenty of the forty buildings of the Wamesit Power Company were on fire at any time when the Bleachery had no right to use the water, if they should put on their hose and put out that fire, I should not expect that they would be sued by the Wamesit Company for damages for so doing! But when they claim that there is water running there that is not used, I claim that during the time they have a right to use it, be it day or night, they have a use which they have designated for it which would lessen the insurance upon all that property a good deal, even though it were used only eleven hours and a quarter a day.

I said that the Bleachery, assuming that there was nothing but a wheel there capable of using all that power, would be entitled to the value of that power to be used or sold. I say, in addition to that, they have a value that is capable of estimation in dollars and cents, by actual appropriation and use, to be added to that; and that is, for eleven and a quarter hours of the day no fire can get into any of their premises without their having the power of applying all this water to extinguish it; and I say that is a circumstance that would diminish their insurance, so that this alone would save them the interest each year as large as it would be on any

amount which you might give.

Then, again, when you come to the question of use for bleaching purposes, you heard the evidence of how much they use. They use three or four thousand gallons a minute. Twenty cents a thousand gallons they pay to the city for the use of their water. The amounts are all down, and

you will reckon from them.

I do not know, gentlemen, that I can add anything more that will help you in arriving at any conclusion here. Reckoning the use which the Bleachery makes of this water in dollars and cents, the amount would come to a very large sum. Reckoning twenty cents a thousand gallons on three or four thousand gallons a minute, with twelve cents for raising a million gallons one foot, and in like ratio, the amount that they use would come to a very large sum. That is one element. The use for fire is another element. The value as power is another element in the Bleachery case

which you are to take into consideration.

I have not attempted to set out in dollars and cents by the tables which I have offered any exact claim which either of my clients makes here. Those are annual losses, and you must give a principal sum which will give the damages each year. I started with those calculations, and I say now, that if you add compensation for damages other than the value of the water taken, you will give to each of these persons a very much larger allowance as principal than any estimate I have made of the compensation to which they are entitled. The tables I made at \$100 a horse-power each year would only give a sum each year which the property taken away from them was worth, were it matter of merchandise in the market, to which you must and will add, when you come to the cases of Mr. Wood, Mr. Faulkner and the Bleachery, such sums as you find their property reguires to make up the damages done to it by the taking of the water.

And now, gentlemen, in conclusion, I ask you to give each of the petitioners a principal sum, the interest of which will give fair and full compensation for the damages which they have sustained in their property, as provided for by the statutes. When, hereafter, the thirsty tax-payer of Boston drinks his glass from the water diverted from its natural channel (the Sudbury and Concord rivers), and is refreshed thereby, do not give him an opportunity of reflecting that the great benefits his city has derived from that diversion have been obtained by paralyzing the industries along the line of those rivers without full and adequate compensation. The rich and prosperous city, in which as inhabitants of this Commonwealth we all have a common pride, cannot

wish, through any ingenuity and ability of those who represent it, to drive a sharp bargain in these transactions. Its citizens will feel the better satisfied, when your awards are made, if, while they have obtained great benefits by the diversion of the water of Sudbury river, no one who is injured by that diversion shall have cause to complain that he is made poorer thereby.

This investigation has extended over a long period of time, and an array of facts has been laid before you such as probably will never be exceeded, if they can be equalled, in any other hearing. And no men can probably ever be selected more competent to appreciate those facts, and derive just conclusions therefrom, and whose combined judgment will commend greater confidence and respect than those on this

commission.

I hope such sums will be awarded to the petitioners, that they will be accepted at once by all parties as just and reasonable, and that in this manner all the controversies between them will be adjusted without further litigation. I thank you for hearing me with patience, and am happy that my labors and anxieties in these cases, however unimportant they may be in aiding you in your deliberations, are drawing to an end.

CLOSING ARGUMENT OF MOORFIELD STOREY, Esq., FOR C. B. SNYDER, COMPLAINANT.

I have no desire, gentlemen, to weary you by going over again the details of evidence which have been presented so elaborately by Mr. Shattuck and Mr. Richardson; and I shall content myself, therefore, with as brief a statement as I can make of my client's case. But I suppose it is important to consider, first, what his rights were before the action of the city; next, what he has lost by that action; and, last,

how much he is damaged by that loss.

First, as to his rights before the action of the city. In reference to those rights there seems to be some difference of opinion. Mr. Butler, during the course of the trial, has made one claim in regard to them; Mr. Child, in his closing argument for the city, has made another; and I propose, gentlemen, to present still a third. My client had the right, under two deeds, to draw from the Whipple canal forty-eight cubic feet of water a second, during eleven and a quarter hours of the day, for six days of the week, whenever the water in that canal amounted to two hundred and eightyeight cubic feet; whenever it fell below that amount, his right was to draw one-sixth of the water in that canal, whatever it might amount to. With the fall at his mill, that number of feet of water a second, applying the formula that eight and eight-tenths cubic feet, over one foot fall, equal a horse-power (p. 409), would amount to about one hundred and thirty horse-power; and, as the testimony shows that from the estimated horse-power twenty-five per cent. must be deducted in order to arrive at the available horse-power for the machinery (p. 410), his available horse-power, after that deduction, would amount to a little more than one hundred horse-power. The same result is reached by his testimony, and Governor Talbot's. Governor Talbot estimated that it would require ten horse-power to run each set of his machinery, which is flannel machinery (p. 400). Mr. Snyder testified that his machinery is used for making cassimeres (p. 683), and it is testified by several witnesses that such machinery requires more power per set than the ordinary flannel machinery; Mr. Snyder also testified, that, in his judgment, it required about ten horse-power to run each set (p. 684), which would reach about the same result, — one hundred horse-power for the mill. The city concedes that

our right would be ninety-six horse-power (p. 684). I take it that one hundred is more nearly correct; and, for the purpose of convenience, I shall assume that that is the horse-

power which our right gives us.

I desire now to call your attention to the deeds under which our right comes. Mr. Butler, on the six hundred and forty-second page of the report, states his claim thus: "You are to draw two hundred and eighty-eight feet, never exceeding that when the height of the water is at the permanent stone dam, and all above belongs to us. We are to keep up the flash-boards, because that tends to keep up the head. You don't own the water; and my construction is, that the Wamesit Power Company own every drop of water above two hundred and eighty-eight cubic feet, and you do not own that two hundred and eighty-eight feet except when

it is running at the height of the stone dam."

Now, gentlemen, I desire to read the language of the deed which describes our right (p. 604), because I think that Ianguage makes it plain that our right is the right to use our portion of the water whenever it runs in that canal, whether the water stands at the height of the permanent stone dam, or at the height of the flash-boards, or is running over the The language is, "Also the right, privilege and easement to take water by means of the canal of the grantor lying southerly of the premises, and leading out of Concord river, and by means of head-raceways to enter the said canal at any points opposite the premises, and to conduct the water to the premises to be used thereon, the same to be done in such a manner as in nowise to injure or weaken the banks of said canal, or interrupt the flow of water therein; also, the right for said water to enter said canal from the said Concord river to the extent hereinafter specified, and the right forever hereafter to have said canal and the banks thereof and the permanent dam owned by the grantor across Concord river continued for the purpose of affording a waterpower, and to the extent and with the exceptions and reservations hereinafter contained and set forth." I read from one of the deeds, where the quantity conveyed is thirty-six The quantity conveyed by the other is twelve cubic feet, which makes the whole amount forty-eight cubic feet. "The quantity of water which may be drawn from the canal by the grantee, his heirs and assigns, is strictly limited to, and shall not exceed, thirty-six cubic feet per second, for eleven and one-quarter hours per day of six days of the week. And if, at any time, the quantity of water in the canal shall not equal two hundred and eighty-eight cubic feet per second during the time aforesaid, then the grantee,

his heirs and assigns, shall, during such time, be restricted to one-eighth of the quantity of water in the canal. Meaning that the quantity of water which may be drawn from the canal by the grantee, his heirs and assigns, shall never, at any time, exceed thirty-six cubic feet per second, for the above-specified time, however great may be the supply of water from the said canal, and that the quantity of water which may be taken by the grantee, his heirs or assigns, shall be restricted to such an amount less than thirty-six cubic feet per second, during the above-specified time, as shall be equal to one-eighth of the supply afforded from the canal, whenever the water in the canal shall be less than two hundred and eighty-eight cubic feet per second for eleven and one-quarter hours per day for six days of the week."

The right is to take a portion of the water whenever it flows in the canal. There are in the language of the grant no words which limit that right by the additional condition that the water shall not be above the height of the permanent stone dam. It will be observed that the right which is given is "the right to have the canal and the banks thereof, and the permanent dam owned by the grantor across Concord river continued for the purpose of affording a water-power." And I presume it is from that phrase that Gen. Butler argues that we have no right in the water above the top

of the dam.

Mr. Butler. No, I did not argue that.

Mr. Storey. If that argument is not made, I shall not answer it.

Mr. Butler. That is not the point. The point is, that however much water is flowing there, you are not to have any more than your aliquot part.

Mr. Storey. I read your claim.

Mr. Butler. I was speaking of the limitation.

Mr. Shattuck. I did not understand that Gen. Butler made that claim.

Mr. Butler. I did not mean to say that you have not the right when the water is above the stone dam to take 288 feet.

Mr. Storey. Let me call your attention to your precise words: "You do not own that 288 feet except when it is run-

ning at the height of the stone dam."

Mr. Butler. Precisely. My proposition is, in a word, that when it is above that, we have the right to draw it down by another canal to the height of the stone dam, and carry it all off, if we like.

Mr. Storey. That is precisely the point to which I was

addressing myself.

Mr. Shattuck. If that point is made, I would like to make a suggestion. I will wait, however, until you get

through.

Mr. Butler. The difference is this: I do not say that you have not the right to use the water while it is running over the dam, but we have a right to draw down the surplus water

to 288 feet; that is the point.

Mr. Storey. I understand, then, that the claim does not differ materially from the claim I was combating. It is claimed that we have not the right to take any water flowing into our canal, which comes from that part of the river, which is above the height of the permanent stone dam; that if the grantor, or his assignee, chooses to draw off that water in another way, we have no right to complain.

Mr. Butler That is very clear.

Commissioner Russell. Precisely as at the Billerica dam, where one of the parties has a right to draw to any extent until it is reduced to a certain point.

Mr. Shattuck. I do not understand that Gen. Butler claims that the city has a right to draw the water down to the top

of the stone dam, if it reduces it below 288 feet.

Mr. Storey. I understand it so.

Mr. Butler. To explain exactly what I mean, my claim is this, that if it were possible, as an engineering feat, to so construct the canal that it would carry just 288 feet, I should have a right to put the head-gates at 288 feet.

Mr. Shattuck. That is as I understand the claim.

Mr. Butler. That is all, and I should exercise the right, if I saw occasion.

Mr. Storey. Do I understand you to claim this—that, if when the water is at the height of the permanent stone dam, the canal will not carry 288 cubic feet, but if when it stands at the height of the flash-boards it will, you have the right to draw off all the water which is between the top of the flash-boards and the top of the permanent stone dam, although by so doing you reduce the amount of water in the canal below 288 feet?

Mr. Butler. Pardon me. If I give you all the water there is in the river (if the canal is not big enough, that is another question), — but if I give you all the water in the river up to the height of the stone dam, above that you have no claim.

Mr. Storey. That is precisely what I understood, and that is what I am combating.

Mr. Butler. When it is less, then you take your aliquot part. I have no secret, and I want my claim distinctly understood; I am a little anxious about that, for very many

reasons. My claim is, that I would have the right to open another canal at the head of the canal, and use the water down to the top of the stone dam.

Mr. Shattuck. Even if it reduced it down below 288

feet.

Mr. BUTLER. No.

Mr. Shattuck. That is the whole question.

Mr. BUTLER. That is, if there are 288 feet in the river, I have the right to draw it down to the top of the stone dam,

whatever happens.

Mr. Storey. Now, our claim is that we have a right to all the water in that river, up to 288 feet, whether the water stands at the top of the permanent stone dam or not, even if it is necessary that it should stand at the top of the flashboards in order to give us that quantity. The language is that we have the right to take the water, and "the right to have the water enter the canal to the extent hereinafter specified." Now, if Gen. Butler, by a canal on the other side, prevents the water from entering the canal "to the extent hereinafter specified," then he conflicts with the terms of this grant. We have the right that the course of the river shall be undisturbed so long as all the water is necessary to afford us our share of 288 cubic feet. The moment he can supply that, and have surplus water, he is entitled to draw off the surplus water, and he may carry it off through another canal if he chooses.

Mr. Shattuck. No, sir; I do not concede that. I did not mean to interrupt you, but as the statement was made in my presence, I did not want to have it inferred by my silence that I conceded it.

Mr. Storey. Now, I desire to call the attention of the commissioners to the reservations.

"And said grantor reserves to himself, his heirs and assigns, the right to lay and use in the edge of the river outside of the bank a tail-race along the line of the conveyed premises, but so as not to interrupt the convenient flow of water from said premises into said river, and the said grantee, his heirs and assigns, shall not by reason of abutting on said river or owning said premises, have the right to have the water from above in Concord river flow in said river past said premises, but said Whipple, his heirs and assigns, retain forever, the right to dam said river above said premises, and to divert the water thereof into and along his said canal for the privilege herein conveyed, and for other privileges established and to be established."

"And the said Whipple, for himself, his heirs and assigns, further covenants that he will forever hereafter, keep and maintain in suitable and proper condition and repair the said canal, enlarged to the capacity aforesaid, and the banks, and parts and appur

tenances thereof; also said permanent dam and the eight-inch flashboards as they are usually kept thereon, subject to such reasonable and temporary interruptions and hindrances as may be necessary in such maintenance and repairs."

Therefore, gentlemen, you will observe that he gives us the right to have the water of Concord river enter our canal until we are supplied with the quantity of water which this deed conveys, and in order to fortify that right, he covenants with us that he will maintain the dam, and maintain the flash-boards for the purpose of keeping up such a current of water in the canal as will afford the amount to which we are entitled under his conveyance.

Now, as I understand the claim of the city, it is that these covenants do not run with the land, and to that point I desire

next to call the attention of the commissioners.

Mr. Butler. I have not claimed that.

Mr. Storey. You claimed that to me in the elevator

going down.

Mr. Butler. Pardon me. I simply claimed that the covenant to build the canal did not run with the land. He covenants that he will build his canal of a certain size. I admit that he must keep the canal and flash-boards. I only say that the covenant that he will build the canal is a personal covenant, that does not run with the land. He might as well covenant that he will build a church. We are to maintain the canal just as it was when you accepted it, just as good as it was, and we are to maintain the dam, we are to maintain the flash-boards, but if the canal will not carry 288 feet, we are not obliged to do anything but keep it.

Mr. Storey. One of the conditions of this grant is -

Mr. Butler. There are no conditions, I guess.

Mr. Storey. One of the terms of this grant is "that he will, within seven months from this date, so enlarge the said canal that the same shall be of sufficient capacity at all times, when the water in the river and canal is as high as the top of the said permanent dam in Concord river, to carry and discharge not less than two hundred and eighty-eight cubic feet per second, for eleven and one-quarter hours per day, of six days of the week, without the water therein at the head of the head raceways of the grantee being drawn down more than six inches below the top of said permanent dam." In other words, we have a right to have the water flow into the canal in sufficient quantity to supply the two hundred and eighty-eight cubic feet, without its being drawn down at the foot of the canal (for the terms are the same as those in the

deed to the Lowell Bleachery) more than six inches below

the top of the permanent dam.

It was argued for the city, in the opening close, that we were not damaged so long as the water taken from Sudbury river did not exceed sixty-eight cubic feet out of the two hundred and eighty-eight cubic feet to which we are entitled. That argument, as it seems to me, rests on a very imperfect examination of the conveyance, for by the terms of the deeds, if a single foot of water is taken from the canal, which reduces the total quantity below two hundred and eightyeight cubic feet, of that single foot we lose our aliquot part, — our sixth, in this instance. It is not that we have onesixth of two hundred and twenty cubic feet, we have onesixth of two hundred and eighty-eight cubic feet, and a sixth of any quantity less than two hundred and eighty-eight cubic feet which happens to be running in the canal. If you take out forty of the two hundred and eighty-eight cubic feet, we lose one-sixth of that forty. That is the express language of the conveyance. That is our right, and the moment, from any cause, less than two hundred and eighty-eight cubic feet runs in the canal, that moment we are entitled to draw less than our full forty-eight cubic feet, whether that cause be a diversion by the city, or a failure in the natural supply.

Mr. CHILD. Or whether it is taken by the Wamesit

Power Company.

Mr. Storey. No, sir; not when it is taken by the

Wamesit Power Company.

Mr. Child. Whether the Wamesit Power Company uses it at one end of the canal or the other is of no consequence.

Mr. Storey. I should leave that question to the com-

missioners, under the construction of our deed.

That, then, we conceive to be our right, whenever there is water enough in the river, we are entitled to one hundred

horse-power.

The next question is, what the city has taken, and I have already contended before you, gentlemen, that what the city has taken is defined by the language of the written taking which has been filed and recorded, to wit, that it is all the water of the Sudbury river. I understand the commissioners to have ruled, that, in ascertaining our damages, the use, or the extent of use, which the city will naturally and reasonably make of what they took, is to be considered. I understand that what the city have taken from us is the right, which forms part of our whole right, to have the water of the Sudbury river flow in its accustomed course past our

mill. That right is gone. We can no longer sell it, or lease We can no longer rely on it. If we have a contract to make, that portion of the water-power on which we should rely to complete it is gone, and the measure of our damages is the value of the right. The city having actually taken it from us, having actually entered upon the property which they have taken, they are to pay us the full value of that right as it would be if we had sold it in fair open market. If, after they have taken it, and after they have entered, they do not see fit to use it for twenty years, that does not reduce by one cent our claim for damages, nor does it make, as I conceive, any difference that they cannot use it. I refer to the case of Harrington vs. the County Commissioners of Berkshire, 22 Pick., 263, and I propose to read a passage from the opinion of Judge Shaw. That was a case where the County Commissioners of Berkshire took a certain portion of a man's land to lay out a street. He brought his petition for damages, and recovered a verdict, and while that verdict was pending on exceptions in the Supreme Court, the County Commissioners discontinued the road, and, from the time they passed the original order until the discontinuance, they never entered on his land at all, or disturbed it in any way; so that in fact their action never inflicted upon him a particle of damage. The field which they had entered upon remained undisturbed. He had the entire use of it, and, by the discontinuance of the highway, he was left in precisely the same position which he would have occupied if no action whatever had been taken by them.

"It is now contended," says the Chief Justice, "for the respondents, that it would be highly unjust and inequitable to require the public to pay the whole value of the land for a naked right or privilege which they have never used, and now never can use; and that it is equally unjust for the complainant to demand a sum of money by way of damage for a loss which he has not and cannot sustain." That is a very succinct and exact statement of precisely the position which I understand the commissioners took in their ruling, and that position the Court distinctly overrules in this opinion. conceive that there is a little fallacy in the word "use." means either the purpose for which the land is taken, or the extent to which it is used for that purpose after it is taken. understand the rule to be this, that the purpose for which a man's property is taken by the public may be considered in estimating his damages. If by reason of the purpose, the damage is more or less than it would have been if the land had been taken for another purpose, that may be considered; but if, after they have taken it for the special purpose, they

do not see fit to use it at all, that last consideration is not to be regarded in fixing the damages. The commissioners referred to the case of Dickinson vs. The Inhabitants of Fitchburg, which was a case where a part of a man's land taken for a street, was laid out as a sidewalk, and the respondents offered evidence that it was laid out as a sidewalk, for the purpose of reducing the damages which the petitioner claimed. The Court say: "We think the evidence of the fact that, when the damage was assessed, a sidewalk had been laid down on and over the land, and of the value such sidewalk was to the estate, was rightly rejected by the sheriff, because that use might be changed to any other use to which a street may be appropriated. But the uses to which such a strip taken to widen a street in a village or city, would probably be applied, for a sidewalk or other use beneficial to the adjacent owners, might properly be taken into consideration in estimating the benefit to be set off against the damage done to the same estate by the taking." This rule was applied under the special provisions of the highway act, which required the commissioners, in estimating the damage, to consider, first, the loss which the estate had sustained by the taking; and then the benefit which the estate derived from the use to which the part taken was put, and then offset the two. But I do not understand that there is any claim in this case that our estate is benefited by the purpose to which this water which the city has taken is applied, and the fallacy, as it seems to me, lies in the two meanings of the word "use." The purpose for which the water is taken deprives us of it entirely. They might not use it for that purpose for a hundred years, but under the case in the 22d of Pickering we are entitled to the value of the right we have lost. value of so much property has been taken out of our estate. That damage we certainly have sustained. It may be that in addition to the value of that right, a damage has been inflicted upon the residue of the estate, and for that also we are entitled to be paid.

Such is the theory of the law, but I do not know that in this case the question which I have discussed is of much practical importance, for what is it which makes this right to have the Sudbury river flow in our canal valuable to us? It is the certainty that we can depend upon that quantity of water when we need it. Suppose, for example, the city were to say to-day, "We will grant you by deed the right to take the water of Sudbury river when it is flowing over the dam at the rate of 3,200 cubic feet a second." We would not pay them one cent for it, for the reason that at such a time we have all the water to which we are entitled without

it. That which makes the right to have the Sudbury river flow by our premises valuable is the certainty that when we need that water to make up the portion of water to which we are entitled under our grant, we can rely on it. At those times when the city does not want it, it is not valuable to us.

It is argued for the city that our damages are to be estimated by supposing that we only require this water during the three summer months, June, July and August, and those three months were especially named by Mr. Child. that argument was made, the evidence which was before the commissioners must have been overlooked. It is not possible to name three months of the year in which the water is at the lowest point. That is shown by the tables which they made up of the thirteen dryest months in thirteen years. They were the thirteen dryest months selected at random, one year January, and another year July. The thirteen dryest months in thirteen years, - May, June, July, August, September, October, November, or whatever they happened to be (p. 700). But I desire to call the attention of the commissioners to the other tables which have been put into the case, and first to the tables put in by Mr. Fteley, showing the measurements of Sudbury river (pages 806, 807 and 808). The first shows the daily yield of the Sudbury river and Farm pond during 1874, in cubic feet of water per second, and I have taken the pains to go through those tables and pick out the dryest days, and I find that, in 1874, the dryest day occurred in September, when there was only 12.10 cubic feet flowing in the river. The next dryest day was in October. The next was in November, neither one of which months is included in the three months during which alone, according to the argument of Mr. Child, we suffered damage. During the year 1875 the average flow of Sudbury river during the dryest month in the whole year, was 12.4 cubic feet, and that dryest month was January. During the month of June the flow was 104.6 cubic feet. During the month of July it was 38.7 cubic feet. During the month of August it was 47.6 cubic feet. The next lowest month was again not one of the three named by Mr. Child. It was the month of September, when the average flow was 24.9 cubic feet. Then I will call your attention to the tables that were put in by Mr. Tilton, showing when the water was running over the dam (pages 711, 712, 713). In 1874, during June and nearly all July it ran over. During the month of August, 1874, beginning with the 10th, it ran over five inches, - five, four and a half down to two. During the month of September, the next month, it ran over, on the 1st day, one inch. On the 9th, 10th, 11th and 12th, half

an inch, and a quarter of an inch: the half inch on the first two days, the quarter on the last two days. On no other day, during that month, did it run over at all. During the month of October it did not run over at all. During the month of November it ran over only five days, and the highest point which it reached was one inch. And during the month of December it run over only fourteen days, and the largest amount that ran over the dam was one inch. Turning to 1875, during the month of January no water ran over at all, in February only four days; whereas, during the months of June, July and August, the three dryest months, as claimed, the water ran over, and sometimes as high as eight inches. And the same results are obtained by examining the tables more carefully; but I have stated enough to show you that it is idle for the city to argue that our loss is sustained only in the months of June, July and August, for, by the tables that they themselves have introduced, they have proved that we have been short of water, during the last three years, quite as much in the winter as in the summer. During the months of March and April, while the snows are melting, we may be reasonably sure of having more water than we need; and if the city were to grant us every right which they could, to have all the water of Sudbury river at that time, we would not pay them one cent, because it would not be of the least value The same things which make it of no value to them destroy its value to us. I have stated this for the purpose of showing that that which gives the value to our right is the certainty that we can rely on this water when we need it; and we need it not during three months, but during the whole year.

I have followed in my argument thus far the order of Mr. Child, on three points. The next point which he made in regard to our right was, that there is no evidence that we are riparian proprietors,—there was no evidence that we have any right whatever. To that the answer is simple, that we have put in a warranty deed, which shows that we have a right, and defines its character, and that is prima fucie evidence that we have it, and good until it is rebutted. I do not understand that the rule of evidence in regard to a waterright is different from that in regard to a piece of land. Ours is a deed of a piece of land which borders upon Concord

river.

Mr. Butler. Below the dam.

Mr. Storey. Below the dam, with this right to the water appertaining to it; and I think it is hardly worth while to dignify the point by further argument. In fact, I do not

think Mr. Child attaches much importance to it, because he said it was unnecessary for the commissioners to hold with

him upon it.

The next argument is, that we are restricted to the terms of our grant, and it is only when the water runs in the canal that we have any right, and therefore that it is competent for the grantor to prevent the water from running in the canal by digging another canal and making it run on the other side. The answer to that is, that the grantor has especially conveyed to us the right to have the water of Concord river enter our canal, and that water would be interfered with by making another canal. He cited the case of the Essex Company; but the cases are materially different. The Essex Company have granted to various parties who have purchased water-rights from them, the right to have a certain definite quantity of water during the year. By the terms of their conveyance the Essex Company are bound, out of the water which runs in the river, to give them the granted quantity. In our case, they have not granted us any quantity of water absolutely, but simply our share of the water which runs in the canal. The Essex Company, therefore, is the party damaged in that case, because the city takes from them a portion of the surplus water upon which they rely to make good their agreements with their tenants; but in our case, the city takes from us directly, because every drop they take from that river takes just so much from our share of the river. It is not an absolute quantity, but a certain share of the water of the river, and that which diminishes the whole diminishes each aliquot part.

The junior counsel for the city says that there is no evidence that Mr. Whipple was a riparian proprietor. I think the commissioners will find some evidence of that in the testimony; but if they do not, there is evidence enough to show that we have the right which we claim, and it is unnecessary

for us to show the title of our grantor.

Having considered first what our right was before the city took the water, I pass to the question of how much we are damaged by the action of the city. As I have already argued, they have taken from us the right to have that water flow. Now, gentlemen, taking from us the right to have that water flow, only damages us when the right is necessary to us, and I desire to call your attention to the testimony of Mr. Herschel, as bearing on the question of when we are damaged. It appears from his testimony that he measured the water on the 20th of March, when it was running six inches over the flash-boards — between six inches and another higher amount measured the next day. He says that at

that time, by actual measurement, it carried 382 cubic feet (p. 777), but he also testifies that at that time the head was drawn down more than the limit fixed by our grant; if according to the terms of our grant the head was only drawn down four and a half inches at the Lawrence-street bridge, or six inches at the end of the canal where the Lowell Bleachery takes the water, there would have flowed in the canal 287.88 cubic feet (pp. 788, 789) within $\frac{12}{100}$ of a foot of the exact amount which, by the terms of our grant, that canal should hold; therefore, gentlemen, when the water is running six inches over the flash-boards, according to the terms of our grant, we should have just about 288 feet.

Mr. Butler. That would depend upon what the head-

gates allow to go into the canal.

Mr. Storey. There is no testimony upon that point, as

to how the head-gates were at that time.

Mr. Butler. No, but it is regulated by the head-

gates.

Mr. Storey. Yes, sir, it is regulated by the head-gates; regulated in such a way that 288 feet were running at that time. I was about to say that that condition of things is precisely the condition of things when we suffer the maximum damage. Whenever there is just 288 cubic feet running in that canal the diversion of the Sudbury river injures us the most. The diversion of one-fifth involves the loss of the greatest number of horse-powers. On the other side, the evidence in the case shows that for far the larger portion of the year there is water enough in the canal to run those mills. That testimony has been carefully presented by Mr. Shattuck. He has been through the details, and he has shown to you, by the calculations of Mr. McDaniels and Mr. Farrington, about how many days in the year the water-takers on that canal can rely on having a supply sufficient to run their mills. We should be damaged, of course, most if the river always ran 288 cubic feet, never running any less. Now, we have shown that when the water does not exceed six inches, we get no more than our 288 cubic feet, and I think the other testimony which was brought to your attention by Mr. Shattuck, shows you that we get the number of feet which belongs to us during a very large portion of the year. I think I do not overstate the matter when I say that the evidence shows that for nine months in the year we get no more than the 288 cubic feet. That is to say, for nine months in the year we lose our full proportion of the water of the Concord removed by the diversion of the Sudbury.

Mr. Richardson has argued to you, and the argument is sound, that we suffer, perhaps, not our maximum damage,

but at the same time we suffer damage whenever the water in the river falls below 369 cubic feet of water per second; and therefore it would be safe to conclude that we suffer damage, to put it mildly, for nine months in the year either the maximum or less. Now that the Sudbury river furnishes its fair proportion of the water which runs in the Concord river is certainly proved by the weight of the evidence. It is proved by the theory; it is proved by the testimony of experts; it is proved by the testimony of men who are personally familiar with the waters of the two streams; and it is proved by the evidence which shows how much work the stream actually does. That evidence they seek to control in the first place by stating that the doctrine of averages, however correct, as applied to streams of the same size and flowing through the same country, is extremely fallacious when you undertake to apply it to streams of different size, drawing from water-sheds of different size and different character. In other words, that it would not be safe to calculate that the upper streams of the Mississippi contributed their full share, according to the water-shed, of the water which runs over the bar; and that doctrine is undoubtedly correct, but it is to be observed that it does not apply to a case like this. The Sudbury river and the Concord river, until the Concord reaches the Wamesit dam, are not streams of such different sizes, or drawing from such different water-sheds, or having such a different height in the country, or such a different height as compared with their surrounding water-sheds, as to invalidate the general rule. It is perfectly obvious, from the testimony, that the Sudbury and the Concord flow substantially on the same plane. According to the testimony of Mr. Shedd, the fall is sometimes not an eighth of an inch in a mile; according to the testimony of one of the witnesses, who is introduced by Mr. Storrow (page 109), in Fair Haven Bay, when he was measuring the force of the current the wind caught his float and sent it up stream, - there was not current enough to carry it down. That shows you, gentlemen, that between the absolute elevation of the Concord and the absolute elevation of the Sudbury river there is very little difference, no such difference as would lead you to suppose that the water-shed of the two streams did not contribute proportionally to the general volume at the Wamesit dam. And it is also true, as you know from your knowledge of Middlesex County, that there is no such difference in the character of the water-shed, or in the relative height of the surrounding country, as to make any difference. There is some little testimony from Mr. Shedd, - I read it over this morning, - that the water-shed of the Sudbury is good

because the water runs into it rapidly from the neighboring country; that the surrounding country is high; but we certainly know that the surrounding country of the Concord is not. Mr. Shedd says (p. 891):—

"Q. How does the Sudbury compare with the Concord as a

river to furnish power, or to carry off the rainfall?

"A. I think there is no great difference between the Sudbury and Concord rivers. In some respects they may be different, in one way, and that be balanced by differences in another way; so that, on the whole, I think that the supply of water for mill purposes would be about the same from the Sudbury and from the Concord.

"Q. Will you state what those advantages and disadvantages are?

"A. Both rivers are what would be called slow rivers. In general, the Concord river is a slower river than the Sudbury. But the amount of water that would be gathered from the Sudbury drainage area and utilized for manufacturing purposes would be rather greater, I think, than from the Concord.

"Q. Why so?

"A. Because the slopes are steeper, and the water that falls upon those slopes would be less exposed to loss by evaporation than the water that falls upon the basin of the Concord."

There are no underground streams which would be likely to come into the Concord. If the magnitude of the stream depends on its height as compared with the average height of the water-shed, the water-shed of the Sudbury would be quite as likely to supply the fair share of water to the Concord as any other part of the water-shed which feeds the Concord before it reaches the Wamesit dam.

Mr. Shattuck. Mr. Shedd thinks the Sudbury a little better.

Mr. Storey. Not only does Mr. Shedd think so, but Mr. Mills thinks so, and Mr. Mills is familiar with all the sources by which the Merrimack is fed at Lawrence. He considers the water-shed of Sudbury river below Saxonville not equal to the average of the Merrimack water-shed, its water-shed above that point quite as good as the average (pp. 71–87).

I recapitulate here somewhat briefly various pieces of testimony as to the amount which the Sudbury river furnishes. You can measure either by the water-shed, by the theories of science as testified to by experts, or by the amount of work which the stream actually does, or by the measurements which have been made. Mr. Mills estimates that the Sudbury furnishes from forty to fifty-five

cubic feet for the twenty-four hours in the dryest times (p. 90). Mr. Frizell says that it contributes about fortyfive cubic feet (pp. 659, 660). Then there is the testimony of persons who have been familiar with the actual operation of the Saxonville mills since 1839, who testify that in the very dryest times they have water enough to run their mill No. 3 and to do their washing and scouring, and it must be a very dry time when they have not in addition water enough to run the mill No. 2 (pages 214, 222, 223, 226, 405, 406). But taking the lowest time which they fixed, they say they have from seventy-five to one hundred horse-power; fifty to run Mill No. 3, fifteen to run the repair-shop, about ten for the washing and scouring, making seventy-five and a little excess. Now, if you will apply the formula, you will find that $8\frac{8}{10}$ cubic feet with $25\frac{1}{2}$ foot fall, which is there by measurement (page 248), gives them for 75 horse-power 35_{10}^{2} cubic feet, for 100 horse-power 44 cubic feet; and, gentlemen, what they are dealing with is the actual net horse-power, the horse-power which is available to the machinery; and in addition to that they have the additional power which is necessary to turn the wheels, the 25 per cent. which is to be deducted when you reason from cubic feet to horse-power. In other words, if I were to say how many horse-power a given number of cubic feet would furnish, I should be obliged, if I had applied the formula, to deduct 25 per cent. When I reason from the number of horse-power which was available for the machinery to cubic feet, I must add the 25 per cent. Am I not right?

Commissioner Francis. No, sir. Excuse me. When

you should add a third, you have a fourth.

Mr. Storey. I observe that error. I didn't mean to say that I must add precisely that percentage, but that I must make a corresponding addition to the deduction which I made before.

Commissioner Francis. Simple arithmetic, that is all. Mr. Storey. I didn't concern myself with the arithmetic so much as the general theory.

Mr. Butler. The difference between interest and dis-

count I take it.

Mr. Storey. Then I was wrong in putting the addition too low. I am obliged for your correction, not only because it is right, but because it is an advantage in the case. Then I will say I should add a third to the horse-power which is shown here, and where the net horse-power shows 36 cubic feet you should add a third to that, which gives 48 feet; and if you add it to the 44 you get about 58, so that where the Sudbury river furnishes from 75 to 100 horse-power, as it

actually does to the machinery, it must furnish from 48 to 58 cubic feet a second, and in the dryest times; and that you will observe corresponds very nearly with the estimate of Mr. Mills, from 40 to 55 cubic feet.

Mr. Butler. But not with the measurements.

Mr. Storey. Then there is another suggestion. Take the city tables from the Cochituate water-shed. They have concluded because the Cochituate water-shed, which is a neighboring water shed, is found to yield so many feet of water to so many inches of rainfall, that, applying the same ratio to the Sudbury water-shed, you will be able to find what that yields to the rainfall; and on page 700 you find, from the table, that the average yield, in the dryest months of nine years, is 29.2, say 30 cubic feet. This gives, of course, the average of exceptional cases. you get the dryest month in each year, and calculate the average of those, such an average is very exceptionally low. I mean that a single very dry month in nine years may bring the average below the actual flow of either of the eight other months selected. It is to be observed, that, when they select their months, they do not take July and August.

Mr. Butler. Pardon me. You would not let me put in

the tables.

Mr. Storey. Here they are printed.

Mr. Butler. I understand there is a great deal printed which is not evidence.

Mr. Storey. I cite from your questions.

Mr. Butler. You are citing from my questions. Mr. Butler said that.

Mr. Storey. I know he did.

Mr. Butler. You put it hypothetically. You said it

could not go in.

Mr. Storey. That is the result of an hypothetical theory which is stated by the counsel. You may subject the argument, Gen. Butler, to the same infirmity that the testimony is subject to. It is worth no more than the testimony is; but that is the argument which is drawn from your statement. According to that theory we should have the amount I have stated; and I was going on to add, that, in the next dryest month, - a much fairer test of the ordinary dry seasons, the same table would show an average flow of forty-three to forty-four cubic feet; so we reach by that testimony approximately the same result that has been proved by Mr. Mills and Mr. Frizell, and the actual work which that water does, — and these coincidences are not to be overlooked. It is to be observed that the last estimate, if it be competent evidence, must be corrected by this consideration, that the

actual yield of the Cochituate water-shed is very small as compared with the rainfall (p. 637); that the ratio between the two is exceptional, and to apply that exceptional ratio to an adjoining water-shed, where the ratio probably is not the same, is a source of error for which allowance must be made. Then let me take the tables of Mr. Mills, page 30 (and, while it is not perhaps safe to say that one fifty-seventh part of the amount which flows in the Merrimack at Lawrence is always to be attributed to the Sudbury, yet they must help us to form an approximate idea), and call your attention to the fact that, during the five years in which these measurements were taken, there is not one month before August, 1876, when one-fifty-seventh of the quantity that flowed in in the Merrimack is less than fifty feet. I have gone through an elaborate examination, and divided each of the averages by fifty-seven, after deducting the quantity drawn from the lakes, and that is the result. I give it to you for what it is worth. Of course it is subject to various corrections; but the fact is that there is but one month, and that September, 1875, when one fifty-seventh of the quantity flowing in the Merrimack was less than fifty feet.

Now, gentlemen, this mass of testimony is met how? It is met by certain measurements of the Sudbury river, made at the city dam; and those measurements are compared with measurements which were made in the Concord river for less than three months. The measurements from July 6th to September 25th, I believe it is, of the Sudbury river are compared with measurements during that time of the Concord river, and from the comparison it is claimed by the counsel who opened the closing argument for the city that the average contribution of the Sudbury to the Concord, during the three dry months, is only one-tenth. In regard to the accuracy of those tables, gentlemen, I am perhaps hardly competent to speak. This I will say, that, where their accuracy may most easily be tested, I have endeavored to test it. On page 807, in the first column, showing the average yield for January, I find there were five measurements: that by three of these measurements it appeared that 12.4 cubic feet were flowing in the canal; by two it appeared that 13 cubic feet were flowing in the canal; but the average is put at 12.4, to wit, the lowest point reached in the month. The highest point is not considered in calculating the average. I only make this suggestion, as showing that the tables are not accurate. And there is one very singular fact. I have taken pains to go through the tables to find what is the day of least flow in each year. I find that, during the year 1874, the smallest amount was on the 15th of September, and was 12.1

cubic feet. I find that, in 1875, the smallest amount was 11.1 cubic feet, which was on the 1st of August. I find that, in 1876, up to the 1st of July, the smallest amount was 10.5 cubic feet.

Mr. Butler. On what day?

Mr. Storey. That 10.5 was on the 29th of June. So that you will observe that for two years and a half, from the 1st of January, 1874, until the 1st of July, 1876, the quantity of water flowing in the river, at the dryest times, never fell below 10.5 cubic feet of water per second. On the 6th of July the city measurements began, and in the month of July the lowest point which the water reached was six cubic feet, or about half of the smallest quantity which was measured in the year 1874; and the lowest points reached in the three months July, August, and September were 6 cubic feet per second, 7.4 cubic feet per second, and 6.8 cubic feet per second. The smallest amount was less than half of the least amount which ran in 1874, and little more than the same proportion of the least quantity which ran in 1875. The arithmetic is faulty there. But the point is that 10.5 was the lowest point reached before the measurements began; that after that time we have three very low measurements, and that the average of water is lower than any average which you will find in the previous years. You will also observe that the day when we made our view no measurements were taken, so that we are unable to compare the state of things we saw and the quantity which flowed in the river and canal. It is obvious, therefore, from this table alone, if no foreign cause was acting, that the measurements compared with the Concord river were measurements at an exceptionally low time, and no fair test of the capacity of the Sudbury river. If the average, based upon the lowest point of six cubic feet of water a second, would make the Sudbury river one-tenth of the Concord, an average based on 12.1 cubic feet of water, the lowest point reached in the year 1874, would make it one-fifth.

Mr. Butler. Would not that depend upon how much ran down over the dam at Massic?

Mr. Storey. Of course it would. They must be compared together, but in measurements of this sort there are many elements of error which it is impossible to bring out. If the water in the Sudbury river above was held by dams the quantity would be very much less. If any of the mills above on the stream were shut down, the amount which would reach the city dam would be much less than usual. We know the Dwight Printing Works were shut and no water which would be retained by that dam was there; we saw

that in our view. But it is perfectly obvious that the comparison made from such figures as these is fallacious, and that the witness who produced them admits, when he states that notwithstanding these measurements and the comparisons that he has made, there is nothing in his results which in this case invalidates the general rule that the amount of water which the Sudbury would yield would be one-fifth of the water running in the Concord (p. 835). Surely, gentlemen, no strong argument can be based by a lawyer on tables produced by an expert, which the expert himself admits are no guide to the truth. Therefore, I say, that when you weigh the mass of other testimony to which I have called your attention, when the only evidence which contravenes the facts on which we rely is found in these tables, which are not pretended to be a safe guide, the general rule remains unimpaired, and we may safely assume that a fifth of the water which flows in the Concord comes from the Sudbury. There is not, in fact, anything in the character of the two streams which should invalidate that general rule. There is nothing in the testimony of any of the witnesses which should lead us to doubt it, and after that testimony we have the testimony of Mr. Shedd, familiar with the streams, appointed to examine them particularly, who testifies that in his opinion the Sudbury yields on the whole at least the proportion of the Concord river, which it would be supposed to yield from the comparative areas of water-shed. I think, therefore, gentlemen, we have shown that for nine months in the year we suffer the loss of a fifth of the power on which we can rely during that time; and I think as we have shown that during nearly the whole year we have the power which we need to run our mill, we have shown a loss of 20 horse-power for nine months in the year. There is no conclusion which I can give more accurate than that. If you think my argument is subject to qualification, of course it must be made. I claim a loss of 20 horse-power for nine months in the year, and the measure of our damages is the value of what we lose. That is one element, and before I pass to that, allow me to call your attention to the argument of Mr. Child that we are not to be paid a sum of money which will pay us our damages during all the years that the mills have to run, and when they eventually stop, as stop they must, leave us with the capital in our pocket; that in estimating our damages you are to consider the fact that in all human probability this mill will not run forever. When the City of Boston takes from me a corner lot to widen its street, and, remembering that corner lots in Palmyra are worth less to-day than they were once, asks me

to take less than its fair market value because Boston may some day be as prostrate as Palmyra, I will admit that there is force in this argument.

Mr. Butler. Salem is nearer than Palmyra.

Mr. Storey. I take the City of Palmyra. If you take my land in Salem, then I should have the market value of land there; and all considerations of future depreciation are considered in fixing that. I was going to add, General, when you interrupted my beautiful comparison, that when Boston became like Palmyra, then the mills in Lowell and Lawrence would cease to run, and not before. Until that contingency happens, you may safely conclude that the water-power of Lowell will be valuable.

I was also going to add that it is not merely the value which is taken from our property which is to be paid, but there is another element which has been alluded to by another counsel, and which, I think, it is fair to consider. It is this: we have sat here for nearly two months endeavoring to find out exactly how much water-power is taken from these mill-owners, and you, gentlemen, will arrive at some conclusion which will be expressed in figures; but the fact that it has taken so long to arrive at it, the fact that arguments on both sides have been made which indicate a very wide difference of opinions, the fact that the evidence itself is very conflicting cannot fail to impair the value of the property which depends upon that water-power. The person who comes to Mr. Snyder, for example, to buy his mill and power will say "how much am I to take out of the price for the amount which you have lost by the diversion of the Sudbury river?" and what can we tell him? We can tell him that the commissioners said that so much water was taken, and that they had the best assistance that we could afford them; but I venture to say that when he buys the mill he will make a liberal discount from that; he wants to be sure. Let me illustrate by a very common case. Suppose a man offers for sale an estate, and Mr. Bowditch or some other conveyancer questions the title; he may go to the very first lawyer in Boston and get an opinion that his title is good, but he cannot sell that property until the Supreme Court has given its decision upon the title. The doubt makes the estate unmarketable. That which gives its value to the Court's decision is the fact that it is final, — that it makes the title good. Now, if your decision determined how much water we shall lose in fact, - was not merely an opinion as to our probable loss, — then I should admit that this claim which I am making now was not tenable; but inasmuch as every man will insist on guessing for himself when

he buys, it ought to be considered by you. I think any one of you will admit that if my client's mill was put into the market to-day, there is great doubt as to what it would bring, because no one knows how much water is, in fact, taken; the purchaser would say that a liberal discount from the value of the mill ought to be made, because he was uncertain how much water we have lost by this diversion.

Passing from that consideration we come to the next. Supposing that we have lost just a fifth; supposing that we lose 20 horse-power, the value of that is what it will cost us to replace it. If it were possible for us to say that we should need that 20 horse-power from the 1st of January to the 1st of October, and should not need it from the 1st of October to the 1st of January, then the measure of our damages would be more easily ascertained; but when the nine months, during which we miss that power, is made out of a day in January, five days in February, thirty days in August, and so on, — when it is wholly uncertain when that want of the water, which comes from the Sudbury river, may be felt, we are substantially obliged to furnish the power necessary to supply the loss of the water for the entire year; and that conclusion is supported by the testimony which is introduced by the city. Mr. Farrington, I think, testified that if he were obliged to furnish, for three months in the year, at uncertain times, 20 horse-power, it would be cheaper to run his engine all the time (p. 753). If that is true of three months, a fortiori it is true of nine. It costs very little more to run horse-power for a year, than it does to run for nine months. We have got to have the engineer there; the interest on the plant is the same; we cannot dismiss our engineer, and say we don't want him after the 1st of October, because, when we want him again, we might find it difficult to replace him. All the substantial expenses are to be paid whether we need power nine months or a year; and therefore, I say that, in estimating our damages, it is only fair to give us that sum of money which, put at interest, will enable us to replace by steam the 20 horse-power which we have lost, and that in fixing that sum no deduction should be made from the cost of each horse-power for a year. But it is not enough that we should put in a 20 horse-power engine. What you have taken from us is one-fifth of the available horse-power on the machinery, and you must return to us just so much available power as we have lost. order to give us so much available power you must give us an engine which, in addition to furnishing that power to the machinery, will furnish power enough to turn the shafts and the wheels. You must make the addition of an amount,

whatever the percentage may be, necessary to give us precisely the power we need. Moreover, it is not safe, when you want 20 horse-power, to have an engine which will give exactly 20 horse-power available on the machinery; but it is necessary and prudent to have more. According to the testimony of Mr. Farrington, he would put in an engine which would furnish from 35 to 40 horse-power (p. 751). Therefore, gentlemen, you must give us money enough to put in an engine of that size (I am arguing here from the testimony of the defence alone, taking the testimony which is most unfavorable to us); you must give us an engine of that size; and you must give us money enough to run it, so that, by the use of steam power instead of water, we may not lose a cent.

Now, as to what the price of that steam-power is, much evidence has been put into the case, and I think the general mass of the testimony would tend to the conclusion that for that amount of power \$100 a year per horse-power would be about fair. I have not gone very accurately over all the figures. Mr. Bacon's was an estimate for an engine of 320 horse-power, and as I understand it the larger you have an engine the smaller the cost for each horse-power will be. Where you are putting in an engine of 35 or 40 horse-power it costs you more money per horse-power than it does to put in an engine of 300 horse-power. Mr. Mills testified that it would cost about \$60 for a horse-power; but at the time when Mr. Shattuck was interrupted in his argument, it was pointed out that \$60 was the cost of a horse-power when the engine was all ready, — when the fire was made under the boiler, when the engineer and everybody were in attendance (p. 74); what it would cost after you had made all your preparations to run your engine per horse-power more than it would to keep it still, and that he said was \$60 per horsepower. It was not what it cost to buy the engine and boiler too, and employ the engineer and make all your arrangements to furnish horse-power when it was needed, but supposing all that was done, supposing it was a question between letting an engine lie still and running it, it would cost \$60 a year per horse-power to run it. Then there is the testimony of Mr. Farrington, and I submit that the question I put to him on his cross-examination illustrates precisely the way he made up his figures. On page 748 he says, when he finally comes to the precise question which was asked, "My opinion is that if the proprietors of the Sterling mill should undertake to supply the 20 horse-power to their establishment it would cost them \$1,500 a year to do it, and that is \$75 a horsepower" - 20 times 75; \$75, the price which the Wamesit Power Company get for a power partly made up of water

and partly of steam. Then, on cross-examination as to precisely how these figures were made up, he says, (p. 760): "I arrived at it in this way: I said that that would leave \$870 to pay for the fireman, interest and depreciation, which I knew was very large; that it would fully cover it." That is, deducting 630 from 1,500 would leave 870. Then I asked him (pp. 760, 761) what items he made it up of, and he said he never had any experience in putting in an engine except two. When Mr. Faulkner was offered as an expert to prove what the cost of a steam-engine was, he was ruled out, and I will read you what his testimony was, in order that you may compare them. On page 682—

"Q. Have you had any experience in putting up and running a steam-engine?

"A. I had a great deal of experience at Billerica." Q. How many years?

"A. Fifteen or twenty years, etc.

"Q. You say you have been acquainted with a steam-engine at Billerica — more than one?

"A. Yes; two or three different engines in the course of twenty years."

And that witness was excluded, and I think properly; but Mr. Farrington was only acquainted with two steam-engines, —one an engine of 320 horse-power, and the other the Wright engine which had been put in by the Wamesit Power Company under certain circumstances (p. 755),—and when he was asked as to what made the cost of steam-power he was unable to tell anything about it (pp. 755, 760, 761). It was ruled by the commissioners, and it was admitted by us, that the testimony of Mr. Faulkner was of no value; and I submit that the testimony of Mr. Farrington stands on the same foundation and is of as little value, because he knew, as his cross-examination shows, no more about the subject he was talking of than Mr. Faulkner. When you consider the elements which go to make up his estimate of the cost of producing steam-power, it is obvious that with any proper allowance the cost would be very much greater. He cuts us down to a second-class fireman; he will not allow us any room for our engine; we must crowd it in some small place in our mill, and we must take the same steam to run it and to do our heating and scouring. Now, we are not to be held to any such estimate as that. The actual practice of men who are looking to their own interest is to be considered, and I ask your attention to the testimony of Mr. Snyder (p. 684), who says that he has in his mill four boilers, and when the engine is not running they use two in order to furnish the steam which is

necessary for their scouring and dyeing, and when they run

the engine they put on the other two.

Now Mr. Snyder is a practical man; he is not a man who is going to waste steam-power; he is not a man who is going to build a fire under two additional boilers and use them when the two which are running will answer to run his engine just as well. If it was possible for him, with the steam furnished by the two boilers which he is ordinarily using, to run his engine and heat the mill, he would do it; but in practice he finds it inexpedient. To run his engine he needs the two additional boilers. One set supplies steam for the engine, the other is to be for the heating and dyeing. Measured by what it will cost, under ordinary circumstances, to make steam-power, I think the whole weight of the testimony in the case shows that for an engine of the size which we shall need in order to repair the loss of power which we sustain, \$100 for a horse-power is a fair estimate. If we needed only a thirty horse-power engine, at \$100 a year, we should need \$3,000, and capitalized at 6 per cent. it would amount to \$50,000, and that would be the damage sustained by Mr. Snyder from the diversion of this river. If you think that a larger engine is necessary, or that my estimate of the cost of power is too small, his damage should be proportionately increased. If you think that in addition to the damage sustained from the loss of water, the market value of his estate is decreased by the uncertainty as to the extent of his loss, for such additional damage he should receive compensation. I give you no figures on that point, because you are familiar with his property and I am not, and any estimate I can give you would be absolutely valueless. We must rely on your personal knowledge and skill and experience. We have given you the benefits of such evidence as we could obtain, but we have done it in the faith that you knew quite as much as any witness whom we have produced. Knowing that, we have laid before you the facts and evidence at our disposal, but we do not rely on the evidence alone; we rely on your knowledge and judgment quite as much to supply the deficiencies of the testimony and to correct its errors.

But there is another point; I don't know that it is worth while to refer to it, but perhaps it is as well to mention it. The extent of the loss is precisely the same whether the water-right is taken from one mill or from the next. In other words, the fact which has been admitted that we have a steam-engine, does not make our damage by the diversion of the water any less than it would be if we had no engine, — no less in proportion than the loss of the Sterling mill, which has lost fifteen horse-power. In other words,

to put a homely illustration, if two men each have a coat, and one has two, and a thief comes and steals a coat from each, the measure of damages is not different in one case and the other; the thief cannot say to the man who has two coats, "You are not damaged so much as the man who has but one coat; you have another to put on your back to supply the place of the one I have taken." What we ask is the value of the right which we have lost. The testimony in regard to steam-power has been put in for the purpose of affording you the means of measuring the value of that right. It is the best practical test that we can offer you. We were entitled to sell that right, to rely on that right, and we must receive its value in dollars and cents, and the measure of that value must be the same, whether one man or another owns it; whether the owner needs it every day, or has so much power that he never uses it. The market value of a horse is the same, whether its owner has twenty more or only one. Its value is what it will cost to supply its place, and that we offer to you as the measure of damages. Capitalized even at a greater rate of interest than has been suggested, our damages would amount to not less than \$50,000.

To recapitulate: Our whole right has been taken. city don't choose to use it, the measure of our damages is not changed. Practically, that consideration is of no importance, because they will use it whenever the right to use it is valuable to us. We would not give them one cent for the right to use the enormous quantities which, as they have shown, in some portions of the year flow over their dam, because those periods of excessive flow do not enhance the value of the right which we have lost. The value of the right depends upon the fact that we may rely upon it in the dryest times and when we need it. The measure of our damages is what it would cost to supply the power which the taking of the right has deprived us of, and by all the testimony in the case we must have not less than a hundred dollars a year for each horse-power which is gone, in order to put us in the position which we occupied before the taking. To supply the power which is gone, we need not less than thirty, and probably more nearly thirty-five to forty horse-power; and I do not mean thirty-five to forty net horse-power applied to the machinery, but an engine which will yield that amount, in order that the machinery may run as easily as it would have run by means of the water-power which we have lost.

We claim a sum of money which will enable us to put in and run such an engine, and in addition to this, compensation for the depreciation in the value of our property caused by uncertainty as to the extent of our loss.

[Adjourned till 1.30 P. M.]

AFTERNOON SESSION.

ARGUMENT OF GEORGE O. SHATTUCK, Esq., ON PETITION OF THE BELVIDERE CO. IN REGARD TO MILL No. 1.

These deeds have been put in, and they show grants from Mr. Thomas Hurd going as far back—

Mr. Butler. Are they put in according to the order?

Mr. Shattuck. They are not put in quite according to the order, because I was not able to furnish all of the deeds at once, and the printers were anxious for copy; but they are substantially in proper order. Deeds put in according to printed pages No. , and they prove our title to $\frac{91}{120}$ of the water on the Middlesex dam, after providing for two breastwheels and a fulling-mill for the Middlesex Company, which, according to the uncontroverted testimony of Mr. Frizell, cannot use over 168 feet per second.

Mr. Butler. I don't understand that he testified that the

present wheels cannot use over that.

Mr. Shattuck. The wheels provided by this deed.

Mr. Butler. Oh, no. The present wheels, my friend.

Mr. Shattuck. I think it covered the present wheels, too.

Mr. Butler. The fulling-mill he didn't know anything

about; of course he could not.

Mr. Shattuck. Oh, yes he did. He made an estimate of that, and there is nothing to contradict it, that only 168 feet per second was called for. If they have any larger wheels which they have put in there wrongfully, it was incumbent upon the city to show it; if they acquired by proscription any adverse rights, it is also incumbent upon the city to show it. We stand here to-day upon our title, which gives us 191 of all the water in the Concord river after allowing the Middlesex Company 168 cubic feet per second. The provisions in several of the deeds, by which the flannel mill had certain advantages on the other side, are not material now, because we own the flannel mill. Of course they are of some value as against the holders of the other $\frac{29}{120}$, but they are not of any substantial value; therefore, I did not care to consider them. The Belvidere mill No. 1, therefore, is entitled to $\frac{91}{120}$ of all damage caused by the taking at the Middlesex dam,

subject to the claim of the Middlesex Company. The first question, therefore, is, how much is the Middlesex Company to be affected? It seems to be agreed that the water has been measured during a very dry period which we have had since the taking. According to the testimony of Mr. Fteley and the witnesses introduced by the city, the testimony is important as showing the minimum supply. It appears that during the time of our measurements, - a period of one month, during the last half of August, when there was a very small rainfall, and during the early part of September, up to the 25th, when the contribution of the Sudbury river was at the lowest point, — there were only three or four days when there was not water enough to furnish the Middlesex Company its full quota, so that I shall assume, for the purpose of this inquiry, that the Middlesex Company is in the position of some of the mills at Lawrence, whose claims upon the water are so small that the withdrawal of the Sudbury river has no substantial effect upon them. Therefore, we ask for $\frac{91}{120}$ of all the damage caused by the taking over a fall of 11 feet and a fraction in the summer, and about 9 feet in the winter. The table from which I have made these computations, unfortunately, is now in the hands of the printer. was the table which Mr. Frizell introduced, but which General Butler asked him to add to, and he made certain additions, and it came here this morning and was sent away.

Mr. Child. Here it is.

Mr. Shattuck. Here is the table. I am obliged to you. I supposed it was in the hands of the printer. It is hardly necessary for me to repeat; but between the 24th of August and the 24th of September, and taking the average flow while the mills were running, and we find that on the 31st of August there were 160.82 feet on the Wamesit dam, on the 13th of September there were 160.47, on the 14th of September there were 139.74, and on the 16th of September there were 135.79. Now, if we add the contributions of Hale's brook to this, the water on two of those days will come nearly or quite up to the amount used by the Middlesex Company. There were, therefore, only two days in that period when there would be any real deficiency. In those there would be such a small deficiency that probably it never would be known. This period has frequently been spoken of by my friends on the other side as the dryest period ever known. Whether that is so exactly or not is not material, but it is of great value, as Mr. Fteley says, of showing the minimum.

The fall in the Middlesex dam, which provides for Belvidere mill, was during this period, as measured by Mr. Fteley,

on the 19th, 20th, 21st and 22d days of September, respectively, 11.48 feet, 11.27, 11.35 and 11.05. Now what are our damages? We have an engine large enough, I suppose, for any emergency. We have used that engine prior to this year about one month in a year, that is sometime in the day for about 30 days in a year, and during that time we have been obliged to furnish at least about 20 horse-power because we could not run the machinery, the engine, without incurring that expense.

Mr. Butler. But pardon me. You stop down there, if I understand it, absolutely when the water gets down, and you must run everything by steam. You cannot draw part

water and part steam.

Mr. Shattuck. Oh yes, we do constantly.

Mr. Butler. What, when you are down below the bolt? Mr. Shattuck. Oh, no; when the water gets down below the bolt we stop wholly. But the practical working of it is this, when they find the tendency of the water is to go below that, they put on the steam and supplement it, and reduce the amount of water used, so as to keep it above that point. That is the testimony.

Mr. Butler. I don't think you will find it so.

Mr. Shattuck. That is the testimony.

Mr. Butler. I am very sure it is not. It would be a very remarkable way of using it, and that is why I don't

think that is the testimony.

Mr. Shattuck. That is the statement made to me, and that is Mr. Stott's testimony. He does sometimes stop wholly, and sometimes he runs partly by water and partly by steam. He stated that fully. He didn't distinguish between the days when they used the full amount and the days when they were using a part of it, but he said there were many days when they simply supplemented the steam, and many days when they run wholly.

Mr. BUTLER. Part of the day they would have to use water, and then they would have to put on the engine for the rest of the day; but I don't understand that they put on

part steam and part water at the same time.

Mr. Shattuck. I have the testimony here:—

"Q. How much steam-power have you? What is your engine?

"A. We have a sixty-horse Corliss engine.
"Q. Whether with your boiler you have more or less than that effective power that you can use?

"A. Yes, sir; if we had any use for it. "Q. How much more, do you think?

"A. Well, we have what is called a locomotive tubular boiler. It would drive considerably more machinery than what we have. I can't say how much.

"Q. Let me ask you, when you use steam as auxiliary, what

amount have you practically used at different times?

"A. Sometimes we have run the water-wheel in combination with the steam-engine. It would be a hard matter to say. It might be two or three horse-power, and it might be ten horse-power; and sometimes the water would be so low that we would throw the wheel off, and run entirely by steam.

"Q. What portion of the day do you run steam?

"A. That depends on the water.

"Q. I mean, practically, — one hour, or all day?

"A. Sometimes we start up in the morning at quarter of seven, bell time, and there will be water enough to run, and we should not run the engine. Then in an hour's time after that, or a half-hour's time after that, the water will run right down, and we have to put on steam.

"Q. When you start steam in the morning, how does it work?

"A. Those things are governed by the water we find the day before, and if the prospect for the next day is that we must use steam, the order to the engineer is to have the steam up ready to run the engine in the morning; and if, after we have run the engine for an hour or two, the water comes down, as it often has come down, the steam we have got up would be of no account. We don't need to use it.

"Q. Practically, how much steam is required when you are

using the smallest amount?"

This has been introduced before, and I have used that in my other argument. Your view of it is correct, except that they did a part of the time use steam with water. Now where they used the steam as auxiliary, they used always as much as 20 horse-power; where they used it exclusively they used as much as 50 or 60 horse-power; and during that month during which they have used steam at all, the damage is almost as great as if they were obliged to use steam exclusively. The change, therefore, which is to be made now in consequence of the taking, is that they will be required instead of using steam one month to use steam nine or ten months. The witness Stott stated that this summer they have been obliged to use steam nearly all the time, except after the freshets. For a few days after the freshets they had water enough; at all other times they had used The problem, therefore, is to determine what it is worth to supply steam. I will call it nine months, eight or nine months. It will probably amount to 40 or 60 horse-power on an average, 40 to 60 horse-power for eight or nine months. It is not attended with the same uncertainty as to the amount that there will be in the case of the Sterling and Belvidere No. 2. I endeavored to impress upon the commissioners that in those mills there was always a contingency which a prudent man must provide for,

and that we could not be made whole unless that was borne in mind in determining what provision was to be made for us. To a less extent there will be the same uncertainty in this mill.

As we have to furnish all the power by steam in many cases, there is not always to be the same uncertainty as to the amount that there will be in the Sterling mill and Belvidere No. 2. I don't think it worth while for me to take time in further discussing the cost of horse-power. If anything shall be added in the argument of counsel for the city, I may desire to allude to it hereafter.

Mr. Butler. Well, I call your attention so that you may have it now. There are three rights taken out of all these; two of them indefinite rights, that I don't find any deed for.

Mr. Shattuck. If you will refer to them I shall be very happy to explain them. I shall have the close, I suppose, on this question. I see no difficulty whatever. There was great difficulty in locating the land, and in connecting the deeds; but after careful investigation it seems now to me to be clear; but if there are any objections which occur to you, of course they will be stated in your argument, and then I will endeavor to get over them.

Mr. Butler. I give you notice that any of these notes

and queries are not part of the testimony.

Mr. Shattuck. You mean notes in here?

Mr. Butler. Anything which is not a copy of a deed goes for nothing, because I cannot tell anything about them.

Mr. Shattuck. There are some of these cases of apparent difficulty. I think, for instance, that Mr. William Sturgis made a deed in which he recited that he had held a mortgage and foreclosed it. But there was no assignment of the mortgage to him on record, and the foreclosure didn't appear; but we subsequently found that the equity passed through other hands to the same party who took the conveyance from Mr. Sturgis. Therefore, we didn't think it necessary to introduce the question of mortgage.

Mr. Butler. I only pointed it out so that there may not be any more time taken to look up deeds. All I want is the title settled. If that is your title we are prepared to take it.

Mr. Shattuck. I don't mean absolutely to conclude myself. I don't know how ingenious counsel for the city may be.

Mr. Butler. It is not a question of ingenuity, it is a question of law.

Mr. Shattuck. I don't mean to say that we will not in

any event, in case of transfers, put in another deed.

Mr. Butler. All I can say is, that there must be a time when this thing shall stop. I have given notice of everything in my power.

ARGUMENT OF HON. D. S. RICHARDSON IN THE CASE OF MRS. NANCY L. RICHMOND.

I propose, gentlemen, to call your attention to some general considerations which, I think, are applicable to the case of Mrs. Richmond. She owns a dam and land on both sides of the river, and an island in the stream, all capable of being used in connection with the water-power. The first question that will be presented to your mind is, what was the original flow of water in that river, that she had a right to before any interference was made therewith by the taking by the City of Boston? Now, it would not be any benefit to her or you for me to argue that question to any great extent. You have had the question most carefully argued, by Mr. Hodges, on the Saxonville case; you have had it carefully argued, in a little different manner, by Judge Abbott, in the Talbot case, because it was argued there in connection with the supply of the Concord river; you have had it, perhaps, more fully argued than in either, and on some different evidence in the Wamesit-dam case; and anything I could say here, in connection with her particular property, would hardly alter the conclusion that you would come to as to the amount of water that originally run in the river. Whatever it was, she was entitled to the whole of it. Now, what property had she first in use in connection with the use of that water? and, second, what property had she which she could change by the addition of buildings and machinery so to use it? Both of these considerations, in my mind, are exceedingly important in estimating her damages. I take it to be quite clear that the amount of water, which she had actually utilized, was about a hundred horsepower. I think in the last testimony of Mr. Coburn, where we recalled him, and went over the items of power which were made, that his old wheels, when water was not very frugally and carefully used, gave 96 horse-power. ber of wheels he gave; their condition was that they were not the best of wheels, and with other wheels no doubt the water might be used to better advantage. She had erected buildings, and put in machinery, and that utilized water, and produced the income which the uniting of the power and the machinery and buildings would give her. That is, that water, controlled by the dam and utilized by machinery, stood in a different relation from the water which was running by over the dam, and which would require some capital to be invested to get an income from. She has a right to that water day and night. The cases we have just tried limited the rights to eleven and odd working hours in the twenty-four. She is entitled to use that water-rights, and just so much more should be added to the damage done her as, according to the ordinary business of life, such water

would be used nights.

Take it, therefore, that she has 100 horse-power utilized, - taking it without going into the 22 per cent., as we did in the case of the Wamesit dam, - taking it at what my brother Story took it (at one-fifth), for convenience of calculation, as what has been taken in the other cases, — the City of Boston has taken away from her 20 horse-power that she had actually appropriated and used on her land and with her machinery. Now there comes this question. My brother Butler will say, "Well, she has got more horse-power which is not used and is not worth much; she can put it in there, and you must give her that value." I don't believe that is a fair way of estimating her damages. When the Concord supplied four-fifths, and when the Sudbury supplied onefifth of that river, you are entitled to treat the waters at the dam of Mrs. Richmond as well as at the Talbot dam, as supplied in the same proportion from these rivers. This question don't become material to any extent at the Wamesit dam, but you are to treat that 100 horse-power where there is no limitation on the rights as made one-fifth of it by the Sudbury water and four-fifths of it by the Concord water; and, when they have taken away the Sudbury water, they have taken away one-fifth of water that in the course of nature did and could not help going to supply her 100 horse-power which she has used. If that is true, then, if she has had 20 horse-power taken from the 100 which she was using, it was her great good fortune that she had other means of supplying that want; but, in taking that, she injures the rest of her estate, by lowering the water that would improve it. That does not lessen the damage that the city should pay her or the value of what it has taken.

Twenty horse-power at the \$100 estimate would give Mrs. Richmond \$2,000 a year. Reckoning that the flow of water would be so great in the three months that it would not be of any importance to her, then take out one-fourth, \$500, for that, and you have \$1,500 a year in actual value that they have taken away from her wheels and her mills, in the proportions as I have said before — \$1,500 annually takes away from her a sum that a capital of \$25,000 only will supply. Now, besides that, you have a further supply of

water that belonged to her dam and lands, and to the damage to that whole available supply she is entitled. What did the legislature mean when they asked you to compensate the owners of property on the Concord river? Did they mean only that, so far as that water had been appropriated, you should estimate damages? Did they mean that, if a person had a dam and a piece of land that was worth \$10,000 with the water, because the water would increase the value of the land, you could take away all that water and pay nothing, and say, "Why, you never had appropriated the water; it was running by to no use"? I say that there is no such meaning, and every person who had a dam has a right to the value of the water, the enhanced value of it when it is appropriated, and to a less value for that which, by any ordinary means on that land, he could appropriate and utilize.

This estimate is based upon the same estimate that we have had before, upon the ordinary working-hours of the day. A large part, more than half, of that power is appropriated to paper-making, the rent of which is \$3,000 a year to her, and that paper business permits her, requires her, to

use that power nights as well as days.

In this connection, one word as to the consideration of the deed which was put in of the half of this property owned by Alanson J. Richmond. It was put in for the purpose of showing that, several years ago, Mrs. Richmond's husband paid a sum with the mortgages on, of \$15,000 for half of it; and I suppose this evidence was put in with a view of asking you, that, in finding her damages, you be governed to some extent by that. I say that recent sales only are of value as to the market price. They are of little or no consequence in any of these cases, because none of the parties here have put them in except as incidentally; and see how absurd it would be to reckon on that property as worth \$30,000 when, as it now exists, only the 100 horse-power appropriated and let, — and, in one case, only a mill, and no machinery furnished, — it shows, as a return, \$6,000 a year income and all the rest of the power and the rest of the land waiting to be improved and give a like return. So I say it is no guide, and none of the parties in these cases have relied upon it as a guide. It has been put in as evidence, but it is so insignificant that you never will consider it.

Taking, then, I say, what proportion of the power she used that has been taken away, giving her the value for that, you have the rest of the power which she has by the position of her land a right to the benefit of, either as increasing the value of that land, or in adding some weight to the

future possible improvements. Her case is situated differently from any other case on the river. She has the 96 horse-power appropriated; she has the balance of the power with ample land to put up structures, and she has also a canal already dug, but not yet in use, which, with the addition, as the witnesses agree, of \$1,000 can be made a complete canal for use, and by the addition of a \$3,000 wheel would give her 60 horse-power more to-day. Well, now, that is worth a great deal more than water which you could use only by making a canal; it is partly utilized power, and though I admit that a less sum, a less value, should be attached to it than that which is appropriated and fitted to run machinery, yet it is of considerable value, in proportion as it can be easily used and will increase the value of the land on which it may be used. She has the land and the dam, which is in itself the first appropriation of the water, and thus she has the right of appropriating the rest of this power, and it is valuable and increases the value of her land to the whole extent of the ordinary flow of the river.

Now, what I claim for her is such payment for her portion of the utilized power which has been taken away, at such rates as that power was worth, together with the damage that the city has done to her buildings and machinery, by taking the power away. I claim for her the value of the power up to 50 or 60 horse-power which, by the addition of \$4,000 or \$5,000, she could make ready, to be supplied to anybody that wanted it in the same manner the Wamesit Company has made ready to supply not only the little horse-power by water that they have, but also 376 horse-power by

steam. These she is entitled to.

Now, how much water is there there? That is the great question. I say, tired as we all are with the weight and extent of this investigation, I would not endeavor to embarrass; I know I could not help you, in undertaking to define exactly that amount, but I can give you some suggestions on the subject, so far as my case is concerned, which, perhaps, ought not to be omitted. We have been unfortunate, I think, in this and the other case, in having measurements along the line of this river only in the dryest time that has been for years. It is a small guide to the quantity of water, and I think you will find more aid from Mr. Hodge's case and from Mr. Talbot's case in the true permanent flow over a series of years than from measurements made on the Wamesit dam or on the Massic dam. We have made measurements that we have been obliged to take at this period of time, for we had no other. There have been measurements taken at the Wamesit dam over a period of two or

three years before this. They were evidently taken for another purpose, I don't know what. They are put in here, and you are asked to consider them, and must consider them; but I say to you I don't see how you can take a measurement made for two or three consecutive years, at half-past eight o'clock each morning, of the quantity of water flowing over the Wamesit dam, and at no other time in or out of working hours, for us or against us, as indicating how much water daily flows during the year. I shall take the lower and the higher amount by way of illustrating what there seems to be there. ing what Mr. Frizell says, as the result of his measurement during this short and this dry time, we have at the Wamesit dam 220 cubic feet per second before the Sudbury is diverted. If I am not wrong in my calculations, that gives 440 horse-power at Wamesit falls. I deal in figures approximately because they are more convenient. I take one-third of that as Mrs. Richmond's power at the lowest state at Massic falls. I do this because that 440 horse-power at 25 feet fall at the Wamesit dam, she having 8 feet fall, gives her about onethird, or 146 horse-power; so that if you find that it would be prudent for her to calculate to use at her estate only the lowest, the minimum, which could be relied upon, you would then say that Mrs. Richmond has 146 horse-power, 100 of it substantially utilized, 46 more that can be made just as good as that hundred by the expense of \$4,000 or \$5,000. One-fifth of the value of that she would be entitled to. If it is as low as that, she is entitled to \$100 a horsepower for the 20 out of the 100 she uses, and not a great way from that for the same proportion of 46 horse-power, over and above that, and which she could with so little expense make just as good as the other. The city have no right to say "Why, we have taken out of your, 100, 20 horse-power, and you can take out of that 46, that 20 horsepower, and it is not going to damage you so much." I say the city is to pay her the damages that were done to her property and its capacities. The damage done to her property was taking what she appropriated, and destroying the capacity of improvement of the rest, what we could make with this 46 horse-power over and above what we have used. But I don't suppose you are going to put any great reliance upon the exact estimate of 220 horse-power for a considerable length of time. You are going to compare that with the sources of supply, with the engineer's estimates, with the uses to which the water has been proved to have been applied at Saxonville and at the Billerica dam, and with the quantity of water that all the evidence gives you information of, as existing in the stream. You take it as evidence that at this period that was the lowest possible minimum of water there. You never can go below that;

you will go much higher.

Now there is one other point that I wish to call your attention to, and that is that we have just been trying a series of cases which have involved, I confess, positions a little different from some of those above on the river, because there has been, in the nature of the rights, an inducement to have the quantity more or less, according to the positions you took You have in the Wamesit-dam cases a diversion of 288 cubic feet, an amount which was so far true — which was so far the actual supply that, until the interference with Boston therewith, the owners who took it in that proportion had that supply and were generally satisfied. You have got to find that some portion of that amount, more or less, existed at the Wamesit dam. Now for such period of time as you find 288 cubic feet exists at the Wamesit dam, you find 192 horse-power existing at Mrs. Richmond's dam. All these estimates excluded Hale's brook, which I considered, therefore, of no consequence in any remarks I make here. That was taken out, and it was of but very small amount. From the 576 horse-power, at all such times as that existed at Wamesit dam and supplied the other parties with their rights, Mrs. Richmond, as she had one-third of it, would have 192 horse-power at the dam below; 288 doubled gives us the horse-power. I don't state these with exactness, because I suppose here is a fall of twenty-four, and in order to get the 576 horse-power, we should have it on a fall of twentyfive feet. I only make these allusions by way of illustration, because I cannot tell what proportion you will adopt. I say, that in the lowest estimate of power there, she has 146 horse-power. The city have taken away of her utilized power twenty horse-power; which, at the rate we have established in the other cases, damages her to the extent of \$1,500 annually, or \$25,000, and that is allowing she is not damaged at all for three months in the year. She has forty-six horsepower left, which, with a small expense, she can make as useful as that. Deducting that expense from the capital, and she is entitled to the same proportion in damages for that. But if you adopt the 288 feet, or any intermediate, or any greater amount of water, of course her damages are increased in a like proportion. In the case of the 288 feet appropriated at the Wamesit dam, she would have 100 horse-power utilized, and she would have 92 horse-power besides that. Now, it is not for the city to say that it will pay her for the cheapest and poorest part of her property that they have taken.

They are not to say, when they take it, they have left what she has utilized, and take it out of the balance. They have taken a proportion of all the water she used, and when they have taken that proportion they have deprived her not only of the value of the water as it stood, but they have deprived her of the value of the use of the water and of the capacities which her land had of being largely increased in value by utilizing that water, in addition to the opportunity of, by a small outlay, putting that water in condition to be as valuable as the already utilized water.

I ought not to take up any more of your time in her case, except to say that you will find, and you will find it, no doubt, not from the evidence on her dam alone, but from all the evidence in the case, what water substantially she has in connection with her dam, buildings and land. You will find how much of that water is utilized, and how much, for the interference with that, is to be paid. You will find how much of all the remainder can be utilized at a reasonable expense, and, taking out that expense, allow her for that and for the damage her land has suffered thereby. I undertake to claim that an estate like hers, situate in the City of Lowell, where we have increased about an average of a thousand inhabitants a year down to this time, which began with big mills and large capital, and is now growing with small mills and small capital, is not only exceedingly valuable to-day, but every day that Lowell grows is going to be more valuable; and when you look at her case, you must look at it not alone in the light of what actual income or money you take from her to-day, but what capacities you take away from her estate for all future time. Take away the water, so that she could not have any power there, and her land, which in connection with the power is exceedingly valuable, would be worth nothing.

I submit to you, then, gentlemen, that, without undertaking to guide you at all other than I have with these few suggestions, in regard to the quantity of water, when you find that quantity, and her reasonable opportunities of using it, and the extent to which she could, by improvements on her land, use it, you will find such a sum as the city has actually damaged her in the property so far as used, and the value of the whole available water, used or not used, which has been taken away from her dam and land. You will add to that sum such damages as you think she has sustained in her land by reason of the diminished capacity of that land for future use and improvement, and therefore in diminished value.

Mr. Storey. I used one-fifth in my argument. I didn't mean to make any distinction between that and 22 per

cent., or to indicate that I differed from Mr. Shattuck and

Mr. Richardson in their estimate of proportion.

Mr. Butler. I want to call the attention of the commissioners to the case of Harrington vs. the County Commissioners of Berkshire, which in my judgment does not touch the case at all, but I may be mistaken about it. In this case, Harrington had had the road laid out over his land by the County Commissioners—

Mr. Storey. On paper, but not in fact.

Mr. Butler. Had had the road laid out over his land by the County Commissioners, and had had a verdict of a jury giving him damages for that laying out, and, while the question was pending as to the acceptance of that verdict—a question of law—the County Commissioners discontinued that road for a good reason, and undertook to plead such discontinuance in suit.

"It is now contended," says Judge Shaw, "for the respondents that it would be highly unjust and inequitable to require the public to pay the whole value of the land for a naked right or privilege, which they have never used, and now never can use; and that it is equally unjust for the complainant to demand a sum of money by way of damage for a loss which he has not and cannot sustain. If there were any middle course to be adopted, if any apportionment could be made, by which the complainant could be indemnified for the actual trouble and expense to which he has been subjected, and the public exempted from further liability, it would be more in accordance with principles of equity."

In this case you can take another course; but the trouble was here that they could not.

"But there seems to be no legal principle on which this can be done. It was suggested that he should claim damage for the discontinuance; but the discontinuance, as it relieves his estate from a burdensome service, to which it was subject, by a perpetual easement, is a benefit, and not a damage; indeed, the damage given on laying out the road is a compensation for imposing this service on the land. It is, therefore, a question of legal right to the sum fixed by the verdict, and the adjudication upon it, by the Court having jurisdiction of the subject; and it appears to be a necessary consequence that the complainant is entitled to the whole amount, or to no part of it. If the adjudication discontinuing the road vacated all the prior proceedings, including the verdict and judgment of the Court of Common Pleas accepting it, that judgment is in effect reversed and annulled, and then the complainant can make no claim under it; otherwise, it remains in full force, and he is entitled to the entire benefit of it.

"Such being the question, the Court are of opinion that the petitioner, on the return and acceptance of the verdict, acquired a

vested right to his damages, and that the subsequent discontinu-

ance of the highway did not divest or defeat that right.

. . . "The Court are, therefore, of opinion, that when the highway is once completely established, and the damages of the land owner settled by the modes pointed out by law, the right of the public to a perpetual easement in the land for a highway, till the public shall see fit, for any cause, to discontinue it, becomes complete, and the right of the owner to his damages or compensation for the lien or qualified right acquired by the public in his land becomes vested."

The difficulty was, that under the law there was no way of getting at it. That is what the decision here is. I cannot conceive how that bears upon this case, because here we are upon the question which would have been before the jury, provided, before the jury had tried and passed upon the question the road had been discontinued. Then the damages would not have vested, clearly, under this opinion.

Mr. Storey. I think they would.

Mr. Butler. Not at all. They say, vested by the verdict and judgment. There was no way of getting at it. That is the difference between that case and this. It would be exactly like this case, supposing that after you got your verdict, and we paid over the money, we should come to the conclusion to take the Merrimack river, and never take the Sudbury river. We could not go back again then, because there would be no way of reversing it, no way of getting at it. This case is not the slightest authority, in my judgment.

Mr. Storey. The Court said, whether they used it or

not, they must pay for it.

Mr. Butler. They said, whether they used it or not, they must pay for it, when they had judgment against them.

Mr. Storey. It was because of this decision that that statute was passed, providing that the damages shall not be paid until the property is divested.

Mr. Butler. No; it was because they had got into such

a state that they could not get at it.

Mr. Storey. That decision establishes the principle, that the damages are fixed the moment the title is divested, and the statute says that the damages shall not be paid until actual entry is made upon the property.

Mr. Butler. It was put upon the ground that they could

not get at it.

[Adjourned to Friday, Nov. 3, at $9\frac{1}{2}$ o'clock.]

Boston, November 3, 1876.

The commissioners met at half-past nine o'clock.

ARGUMENT OF HON. J. G. ABBOTT.

I want only to make two or three remarks, Mr. Chairman, and shall be very much within the time I required when here a few days since. I shall take half an hour, and Brother Hodges says he may be a little more at length; and therefore I shall make the few remarks I propose to make first.

I have examined the evidence carefully, so far as I can get it from the reports, bearing upon the relative amounts,—that is, the amount produced at Framingham and the amount at the Wamesit dam or at the Massic dam, whichever it may be, — and also the theory put forward by Mr. Herschel in reference to water-courses in the high lands, further up the streams, producing less than water-courses further down. I have to say upon that subject, sir, after examining the testimony, and that, especially, from Mr. Fteley, and the argument of my friend Mr. Shattuck upon that matter, that I have nothing to add. I don't believe anything I could add, after looking at it carefully, would tend to lighten counsel to any considerable extent, and therefore, with this tribunal, I don't think it necessary to weary you or weary myself by saying anything on that subject, and only a few words upon the question of the amount that has been shown to have flowed over the dam at Massic or the Wamesit dam,—the measurements made at the Massic dam being, I think, from July 6th to September 24th, and on the other dam, by taking the height of the water for a greater length of time on the top of the dam. As I understand the result of that measurement, at the Massic falls, it was this, that during the time I have mentioned, this season, beginning at some time in July and extending sometime into September, the minimum flowing, after deducting the water taken by the city at that point of time, would be about 180 cubic feet a second. believe I am right, Mr. Shattuck.

Mr. Shattuck. Yes, sir.

Mr. Abbott. That is the minimum, as I understood the evidence, — though it is unfortunate in that respect, perhaps, that I didn't hear the witness. The whole effect of the testimony was that 180 cubic feet per second was what could be used during the twelve hours, and there was an addition to

that of a considerable amount, —50 or 60 cubic feet, more or less, —running over the dam the other twelve hours. Am

I right, Mr. Francis, in this respect?

Commissioner Francis. Yes; they gave what would run during the day, — during the working hours, — at so much, and then there was some used during the night in addition. It is in the printed evidence.

Mr. Butler. Flowed away, but it was all measured.

Mr. Shattuck. It was 180 cubic feet per second during the working hours, allowing for the usual amount that went

over after the working hours.

Mr. Abbott. That is what I understood, and the witness said that, after the gates were shut down, he found during the other hours there were 50 or 60 cubic feet a second running; so you have for the working hours, in addition to what may have flowed over the Massic dam in the night during this season and during that particular time, a minimum of 180 cubic feet per second.

Now, gentlemen, of course I need not say and repeat what my brother Shattuck has put before you so fully and carefully,—the utter—I was going to say uselessness, but perhaps that is a strong word, of a measurement made during this season, beginning with July 6th, and ending August 24th, for the purpose of telling us really the practical value of the water, or of the amount of water through a great length of time.

Mr. Butler. You don't get that quite right, Brother Abbott, I think. It is from July 6th to September 25th.

Mr. Abbott. That I thought I said, sir.

Commissioner Francis. You said August the last time.

Mr. Abbott. That is merely a slip, sir. Sept. 24th I had stated it before. Now, Brother Butler has put in the rainfall for the three months of July, August and September, through which the experiments extend, — not quite three months, beginning a little after the first of July, and ending before the last of September, — and has compared them with the average of years. It turns out undoubtedly, looking at that comparison, that the average of those three months is a little larger than the average for the last nineteen years; but it comes from this, sir, that during that time the ordinary condition of affairs has been reversed. The month of August, as we all know, - you may take a series of ten years, or five years, I think, certainly ten years, for any series of years, — the month of August will produce more rain than any other month in the year, and the month of July very much less. In this year it turned out that the month of July was double - say, in round numbers, double - the usual average; and the month of August not quite a third, not a quarter even, of the usual average; and the month of September about the usual average, though the rain all fell towards the latter end of the month, at any rate to a large extent, so that you didn't feel the effects of it, and couldn't feel the effects of it in this measurement of the flow of the river. Now we haven't given to us the month of May and the month of June, and I have not been able to obtain the rainfall for either of those months. I only know this, and I can appeal to your experience upon the matter, that the month of May and the month of June were certainly (that is, after the 11th or 12th of May, six or eight weeks, up into July) exceptionally dry. It affected all the crops; it affected the hay crops, especially, all through this part of New England, from the fact that those months were exceptionally dry. You find then a dry time, to use the ordinary expression, running for nearly eight weeks, - so dry that it affected the surface of the ground very much, and the crops to a very great extent. You had at that time the longest days in the year, and of course, the most exposed to the sun, and the largest amount of evaporation; then in the following July a very large amount of rain, - more than double the usual quantity; and then again followed by a very little or no rain in August; and then, in September, exceptionally dry up to past the middle of the month; certainly the heavy rains began past the middle of September. All I wish to say, Mr. Chairman, to you, and to you too gentlemen, is, that this season, so different, so exceptional from the ordinary common rule of the rainfall, is not a safe guide to go by when you are dealing with a great length of time. Take this case: you have a dry time, extending over six or eight weeks, and at a time when the sun has the most power, the days are the longest, and the whole surface of the ground becoming perfectly dry, dry and hot, and extending into July, and then this large amount of rain; a very great portion of it would be absorbed, undoubtedly, and never get into the stream. By looking at one of those charts it shows that you had, say, a particularly heavy rain at one point of time, in July, two inches or more I think, and it didn't affect the stream at all; you had to wait until you got the next large rain, towards the end of July, before you got the effect in the streams in any way whatever, because the first was taken up in filling up the dry surface that had been made by the long eight weeks of dry weather.

Now, all I mean to suggest upon this is, that, taking that line of measurement precisely as it is proved to have been, it affords you no guide for all the future, and you would be

doing a great injustice if you undertook to take it as any conclusive rule to find out what the state of things would be through a series of years. From these measurements you have the result, that 180 cubic feet per second during working hours, and something more during the night, flowed in the river at that time for less than three months. I have taken, as you will see, because I thought it was the fairest way of getting at the fairest result, the rainfall - not for this time that they have given the measurements: I have taken the rainfall for the months of June, July, August and September, for four months, not less than three months as, upon the whole, the four dry months. I said to you what I say again: I do not take this time as giving the exact limits on the one side or on the other, because I am sure your experience will show that the limits will vary one way or the other. That is, it may not begin until nearly July, and it may extend nearly to the end of October. dealing with this matter you must take a limit somewhere, and that, upon the whole, was as good a limit as I could get. I took the six months from May to October inclusive. and the four months from June to September inclusive. I then took the rainfall for ten years; but on going back, Mr. Chairman and gentlemen, to the nineteen or twenty years that are given, I think, of the Cochituate rainfall, you will find that the results are substantially the same; the variation - and I had it gone over in the rough - is very small, so slight that I didn't think it necessary to give it in detail. But it has an important bearing in this, that you show that, as far as you can go back, the averages obtained are pretty nearly the same; and so that you may depend upon the averages taken for any given time.

Now, I take six months, twenty-five per cent. of the rainfall as the amount we get the benefit of in the stream; and I think I have a right to say from the experience I have had in trying these cases, that for the six months is smaller than the ordinary amount allowed. I took twenty per cent. for the four months; that certainly is smaller than the evidence would warrant, because Mr. Mills testifies to from twenty-five to thirty per cent. for the four months,— the New York experiments gave twenty-eight per cent.,— and it is almost a matter of common knowledge (of course it is an approximate way, all agree), that here in New England, here in Massachusetts, with the ordinary water-shed, you may save out generally twenty-five per cent. It was put in another case before you, by one of the witnesses, at twenty-five per cent., in a case in this immediate neighbor-

hood.

Well, I took it at twenty per cent. Now, the result I get for the four months, after deducting the water-shed taken, is 271 feet per second for the four months.

Now, sir, it seems to me that the two results put together tend rather to strengthen my proposition than to weaken it; and I will tell you why. You have here the measurement taken a little below us, — there is a little addition, but not enough to make any great amount of difference, - which gives 180 cubic feet per second as a minimum, as I say upon the whole, in the worst, and an exceptionally bad time; at any rate, I am inclined to think as bad a time as you can find under any circumstances. You find, taking the average of years for four months, you got 271 cubic feet per second; you find the minimum in one exceptionally bad three months is 180 for the twelve hours, and something in addition for the other part of the time. Now, I say, sir, that this really strengthens rather than weakens the position that I took here, that in dealing with this matter you must deal with lengths of time and with the average coming from those lengths of time. I did not claim, as you recollect, I could not claim upon the evidence, that 271 feet was furnished all the time during the four months; I do not think it was. I think more was furnished at some times and less at others, undoubtedly. In such seasons as we have had this last season, there was a larger amount furnished at some times and less at others. Now, I want to call your attention to another fact in this connection. Talbot's flannel mill with two wheels gives him from 187 to 190 horse-power; that would require 208 cubic feet per second over an eleven foot fall. Now, Mr. Talbot tells you that there has been but twice since he has owned these mills, on two occasions, and then only for a day or two, and not for a whole day at a time, when he has not had sufficient water to use those wheels clear up to their full power. One of those occasions was in the winter of 1874-75, — that very dry winter which ran into January. The city took on the 21st of January, because there was danger of a water famine here, and in the February following two things happen. In January and February Mr. Faulkner was obliged, that winter, to use his steam for the first time in winter. Mr. Talbot for the first time in his life, since he has been at Billerica, for a day or two during that time, when the dry winter, which was extraordinary, and the taking by the city, all conspired, for two or three afternoons as he put it, a very short time he had to throw off some of his machinery in his flannel mill, showing what I want to call your attention to here, that this time for which we have the measurements was an exceptionally dry time and an ex-

ceptionally extraordinary time in that respect. The next time was in the month of September, about the time that you were up there in the latter part of August, or the first part of September — the second time, when an exceptionally dry time was upon us — and all the water was taken by the city; then for two or three days in the afternoon he was obliged to throw off a little of his machinery. During that time, the dryest time with one exception that has ever occurred on that river for the last forty years, since Mr. Talbot has been there, it brought about, from the scarcity of water, what has existed there but once before, and that was in the winter of 1875, and for an hour or two. You find this fact then, proved, that however dry your times may be ordinarily, with these two exceptions, you have 208 or more cubic feet per second as a minimum. You have never got down below that minimum for the driving of that mill except on those two occasions, and then only for a few hours in the course of the day. This shows clearly and conclusively to my mind that there must have been during the working hours of the day accumulated more than the 180 cubic feet per second, certainly up to 208 cubic feet, for the running of this mill, except during those days in August and September, when in the afternoon it got a little lower. That is all I desire to say on that matter in addition to what my friend Shattuck has said on the other side, and other gentlemen; and I adopt what he has said, for it seems to me to be very pertinent and striking, and well put. I desire now to make a few remarks upon the law that my friend here put in since his argument was made, and which since it has been furnished I have examined.

Mr. Builer. Before you go from that, do you want to change your figures and tables in your other argument, showing what is the reliable flow of water at Billerica mills, what may be relied upon? I do not mean in exceptionally dry times, but what may be usually relied on.

Mr. Abbott. No, sir. I claim, on the contrary, on the whole, that, on all the evidence we have in this case, those results are substantially the only thing you can rely upon, taking through a series of years, and I think these measures, as far as they go, tend to strengthen rather than weaken those tables. I ought to have said one thing more, and you have now called it to my attention. I am inclined to think I may have erred against myself in this way, in not claiming a long enough time of deprivation of water for Mr. Talbot. You recollect that I claimed for Mr. Faulkner, that there were six months, from May to October inclusive, when the water would be taken from him, and then in addition some time in

the winter. I am inclined to think, and I want your attention, because I know you will desire to give us all our rights, to the force and effect of this testimony of Mr. Tilton's, which was put in by Mr. Shattuck—

Mr. Shattuck. Mr. Tilton's testimony was put in by

the city.

Mr. Abbott. I thought it was put in by you, although I knew the measurements were taken by Brother Butler's direction. I am inclined to think the force and effect of that testimony is to show that Mr. Talbot will be affected by this diversion more than the six months in the year, and I make the suggestion to you, and I want you to consider it. I was a little surprised at some of the measurements on the dam, I confess, during some of the months, and I am inclined to think the diversion will take water from Mr. Talbot more than six months during the year, and that there will be times in the winter months when he will be affected considerably.

Now, sir, in reference to the law; on looking at the cases I think you will find what I indicated before, that so far as the power to sell by a corporation is concerned, all those cases deal substantially with the selling of the franchisc, and a selling of the land, which is so clothed with the franchise that it is impossible for the corporation to go on with their business after it is sold. All those cases refer to and deal with an actual sale of the franchise. Now the difference between those cases and our case, — and as I said to you, this very deed to Mr. Talbot was sustained by the Supreme Court in the case of Talbot and Hurd, although the canal then was in full life, - is this, that Mr. Talbot buys property subject to this franchise, not undertaking to put an end to or to interfere with the franchise, but subject to it and leaving the franchise absolutely intact, and with the provision made that he bought only the property, that was not necessary to exercise that franchise; the land bought is to be used subject to that franchise as long as it exists. That is the difference, and I need not do more than indicate it to the chairman.

Then in reference to the other class of cases, sir, and to the claims made that the Commonwealth, having granted to the Middlesex Canal the franchise to take property for one public purpose, has a right, at a subsequent time, to grant to another independent corporation the right to take that same property without a farther payment of damage, whether the purpose and object of such taking is the same or entirely different. The first criticism, Mr. Chairman, upon that claim is this, that the objects, the uses, must be substantially the same. That is to say, if you take, for example, land for a common highway, where it is supposed the land-

owner may receive the benefit from the highway, from his land abutting upon it, and an easement is taken merely, not the ownership of the fee, can you appropriate the easement to another and different use? Now, although the courts have said that while the highway exists the Commonwealth may permit the laying down of a horse railway on the land taken for the road, they have never gone so far as to say the Legislature may grant, without any farther compensation, the right there to dig a canal and to turn a common road into a water-way, to be used by boats instead of by common teams.

Mr. Butler. But they have turned a canal into a railroad in Blackstone.

Mr. Abbott. Undoubtedly; but there the difference would not be as in the case I put. With railroads and canals except at stations there is no benefit from them to the landowners. They have never gone so far as to permit a common highway to be turned into a steam railway even, without further compensation. Now, here is a new use, not the use of the water on the land, as in the case of the canal, but it is an absolute taking away of the water from the land. Take the question of damage, there will be very different considerations bearing upon one case than there might be in the other. That consideration might be entirely sufficient; but there is another reason, and it seems to me one entirely controlling whatever may have been the rights of the Commonwealth. I do not concede by any means that they had any such right to take this property and grant it to the City of Boston without payment of damages, if the Middlesex Canal Corporation had been in full life at the time of the taking; that state of things did not exist. The Middlesex Canal franchises had been taken back by the Commonwealth; they had been ended by the Commonwealth; they no longer existed; so at the time of the grant to the City of Boston you may look upon that grant precisely as if the grant to the Middlesex Canal had never existed, because, supposing the Middlesex Canal, instead of buying the land, had merely got an easement to use the water for a certain purpose, that easement was at an end; the franchise to use it, that was at an end; where was the property? Why, it reverted to the original owners; it had gone back. Now, can there be any case produced,—certainly there is none produced here,—where after the franchise has been ended by the Commonwealth, has been taken back, and the corporation put an end to, and the right, whatever it may be, to the land has reverted to the original land-owners, - where there has been a subsequent grant of the same property by the Commonwealth without compensation to be paid anew? Has there been any case without the payment of damages for the new taking? In that respect, I say this case is as wide as the poles are apart from the cases cited by my friends on the other side. That is all I desire to say because it is not necessary to go over matters where they have been gone over by my friend who preceded me.

There is one case I want to call your attention to upon another point, which I did not see had been cited. I mean upon the question whether the City of Boston is responsible for all the water above their taking. That is, not for what they may probably take, but for all of it. In the case of Ham and Salem, 100 Mass. 350,—that case was this; the water board took land for a conduit for the City of Salem, and almost under precisely the same provisions as are made for the taking of this property. The City of Salem took the land for the conduit and described it, and there stopped. The petitioner made his claim for damages, and the answer of the City of Salem was twofold. The petitioner's claim was that they must pay actually for the land just exactly as if it was carved out, and he had not any possible right of using it or passing over it. The answer was twofold, as I have said: first, we will take away the fences and give you the right to pass over it as you wish; the next was, that the purpose for which it was taken, to build a conduit underneath and draw water through it, does not interfere with the land for any uses, because we take an easement simply; and that taking is not inconsistent with the owners' use of the land for all other purposes, such as passing over it. The argument here was that the city could not and would not take all the water, and so ought not to pay for what they could not take nor use. The argument there was, the city have only taken an easement in the land for a certain purpose, and cannot prevent the owner from using it in any manner not inconsistent with that easement; and some of these cases were cited where the court held (I believe you cited one, Brother Butler, in your brief) that the owner of the fee in the land over which a turnpike was laid out, could maintain an action of trespass for taking the grass. Taking that class of cases, the city claim it had taken simply an easement, and the owner has the right to use the land for all purposes not inconsistent with the use of the easement. The court held the city must pay for the land without any reference to the use to be made of it, or the use that could be made of it within the purpose for which it was taken — even going further, and holding that the city could not convey to the original owner a right to pass and repass over the canal. I think the case has a bearing upon the question I have referred to.

SUPPLEMENTARY ARGUMENT OF EDWARD F. HODGES, ESQ.

Probably, gentlemen, it would be very seemly for me to say to you that I should leave this case with the arguments that have been made, and certainly that I felt it was very presumptuous in me to undertake to better the positions that have been assumed and maintained by counsel for petitioners in the other cases cognate to the one I represent. But the cause I urge before you justifies me, perhaps, in two aspects, in soliciting a further hearing. The question we are considering is simply and absolutely vital to the industry my client is prosecuting; and the principles upon which he is entitled to recover differ in some respects from those that are presented by the proofs and records in the other cases. I may be permitted to recall what I said in the opening argument, that my client owns the whole of this river, not complicated by any joint ownership or associated rights. In this view we have before us a simple question: what has the city done to the injury of the petitioner? Before we enter upon the new matter, permit me to revive in your recollections the exact issues that were discussed and considered at the principal argument. The right appropriated and represented by the amount of water available for use furnished by Sudbury river, was then, as now, the matter to be ascertained and appraised; and that was maintained upon the two sides by proofs of various forms and force. showed what power we had used for many, many years; years antedating all the records of rain-gauges, and of statistics concerning the amount of water. We maintained our issue further by showing what to-day we used, not by the measure of the water, but by the measure of the power the water exerted upon our machinery, and in that respect, abandoning every theory dependent upon statistics, and applying and appropriating simply the concrete coarse facts manifested in the work of every day and year of our use of the water. On the other hand, it will be borne in mind that our positions in this respect were in no particular controverted by evidence on the part of the city. The evidence thus introduced, and not contradicted, was met with no other argument than this, that you were to consider, measure, and award compensation for the amount of water the city intended to take at the dates when, in the future, it should be taken. That argument was able, and was clearly presented by the counsel for the city in the close.

I controverted it as best I might; and the case, as it was then represented, both by proof and argument, I was contented to leave for your consideration and decision. Now the case has assumed another aspect; the issues are changed, and the controversy qualified by new testimony introduced on the part of the city in other cases, and which I cannot ask you to eliminate from your considerations when you come to investigate the particular case now under discussion. This testimony, thus introduced on the part of the city, bears upon the proofs we have made concerning the amount of power furnished to us by the river, and likewise develops new legal positions having important relations to our rights; both the facts and the law thus insinuated into our case we

ask an opportunity to answer.

After the very lucid opinion of the commissioners, record, p. 828, denying the right of the city to prove its intentions concerning the taking of the water in future, and the probable dates of such takings, the city practically changes front, and assumes a new position. That is to say, instead of asking you to consider proof of the purpose of the city to allow the water to run in its accustomed channel for many years next succeeding, and when at length it is diverted then to adjust your award for damages to such qualified and remote appropriation, they now ask you to consider the character of the stream, the use of the water, and other cognate facts which probably affect the limit and extent of the use of the water by the city. In other words, instead of proving what the city intends to do, they ask you to decide what, from the nature of existing things, the city in all probability will do? It is not for me to tell the able strategist who leads the city forces, that change of front in the presence of the enemy is justified only when alternated with defeat. And such a change! first you were called upon to decide future intentions upon present proof. Now you are requested to settle future probabilities without evidence.

In short, you, gentlemen, are now solicited to assume the character and rôle of prophets, to throw the light of prophecy upon the future, "to east the water of the land," and tell us what is to be done by the city of Boston in the years that are to come; not what they now intend to do, but what we are to suppose, from the nature of things, will be done.

Now, gentlemen, this will, in one aspect, seriously affect the rights of my clients, and therefore I ask you to examine with me the new facts bearing upon the matter of quantity and upon this new view of the law that is to guide and control your deliberations; and in doing this, while I am ready to accept as we have done through this case the abundant courtesies of the counsel for the city, in this particular I think I am asking to be heard as of right, and not ex gratia.

I will endeavor to express my views as briefly as is consistent with clearness; but I must crave some indulgence, in view of the character and quality of the proofs, for the needful consumption of your time, though I trust I shall not dwell "at length upon the questions," as my brother Abbott kindly indicated his desire that I should. For my tediousness I ask your indulgence. I speak in the performance of my duty, as you listen and judge in the performance of yours. And first, let us deal with the new evidence. relates to two branches of our case; first, the amount of water or the amount of the power, which I consider to be the same thing, furnished by Sudbury river to the use of the petitioner; and, next, the value of it; that is, the value of the power as it is represented through steam as its substitute. I may take occasion to speak later of this second aspect, but it will be with great brevity. The main question of fact is, what is the amount of power supplied by Sudbury river? The proof upon this branch of the case is presented before you in a double aspect; first, with the view of ascertaining the proportional quantity furnished by Sudbury river to the volume of Concord river; the next, the absolute quantity furnished by Sudbury river at Saxonville. Now, the question of proportion is very important to all millowners below us; but to us it is unimportant except as it may relate to or illustrate the proof of actual power supplied by the river.

In respect to these proportions there are certain things which mark the value of these proofs. They consist of measurements taken in an exceptionally dry time, of less than three months in one river, and three years in the other, of which three years for one year and a half they were accurately taken, and for the remaining year and a half measurably accurately, and measurably inaccurately, generally generously I may say. Now, assuming that the measures are substantially accurate, the time over which they extend is too short for you to enter them as conditions in your calculations, or to entertain them as reliable elements of judgment in a matter that extends over all time. "long as wood grows and water runs" has been for centuries in our English tongue used as the comprehensive figure of speech expressing all the future of property interests. are to measure this thing forever, and in a variable subject like this, measures taken for three years in one place and three months in the other are altogether inadequate guides and unreliable data. I allude to this calculation of propor-

tions between the two rivers only as it may bear upon the question of the amount of water at Saxonville, being in all other respects indifferent to the relative volume of the rivers. I may, however, in passing, remark that with those tables before us and the mysterious lines drawn by the city engineers, showing just the relations of the one to the other, with this all before you, all purporting to show the exact proportions, yet in their examinations, direct and cross, once, twice and six times did those cautious and accurate engineers refuse to say that absolutely Sudbury river furnished but one-ninth or one-tenth of the power of Concord river at Wamesit falls. They not only did not say that it furnished that proportion and no more, but they either refused to answer those questions, evaded them, or answered with some conditions and reservations. This refusal was good faith; these gentlemen knew that these measurements were entirely unreliable bases for calculations for future years. The flow of a river cannot, in the nature of things, be predicted with certainty; the nature of the subject forbids such prediction; the multitude and uncertainty of the conditions involved in the problem make it impossible by any law of science yet revealed. But it may be approximately and substantially ascertained by calculations based upon the area and character of the water-shed and the rainfall thereon, measured for a long series of years, so long that the average may be supposed to be fairly qualified by each of the many phenomena that occur in the procession of time, and under varying atmospheric influences. From such calculations all engineers, even those that directed the structure of the Roman aqueducts, have made their plans, not because they were absolutely sound, but because they were substantially reliable and were the best that could be obtained.

Take any area or water-shed and assume that the rainfall for successive years is absolutely the same, and yet it will present a variety of flow as great from year to year as between two different water-sheds. Why? Because the amount of water that flows in the stream and goes over the dam is limited and measured not alone by the water-shed and the rainfall, but by the order in which the rainfalls succeed each other, the intervals between the showers, the atmospheric conditions; and even not that alone, the simple quantity of electricity in the atmosphere and its temperature influencing the evaporation will qualify the whole thing, and all these forbid an absolute equality of flow from year to year. In this view, gentlemen, and dealing with this subject, we must take what is nearest to accuracy, and not

demand the certainty of mathematical demonstrations; and we turn again to the original proposition that the rainfall and the water-shed of Sudbury river must influence you in ascertaining the amount of its flow and the available power furnished. True, the new witnesses produced by the city say there is proof better than these; viz., "measurements taken for a great many years." I shall take occasion to show that something very like those measurements have been proved by us, extending since the year 1829; but before doing that I wish to call your attention to the measurements that were made and testified to by the city witnesses, and to the statements of these witnesses. I wish it understood that all this time I am dealing with this matter only as it relates to the absolute amount of water furnished by Sudbury river.

On page 806 is the first table, and from that 807 the second, and 808 the third, or rather the continuation of the same table. On page 806 is the table of the measurements for 1874. With the exception of one year, that is the lowest rainfall in the nineteen years preceding; and during that time, in the month of September, there was 50 horse-power by these tables. That is to say, the average figuring up will show that there was 50 horse-power in the lightest

month that year, which was in September.

Commissioner Russell. 50 horse-power at Saxonville? Mr. Hodges. Yes, sir. All of my remarks have application to Saxonville only. 50 horse-power, night and day, all the time, was present, an average of seventeen cubic feet per second; seventeen cubic feet per second, in our fall, makes 50 horse-power. It is almost three horse-power per cubic foot; it is a fraction less than three.

Mr. Butler. What do you call your fall?

Mr. Hodges. Twenty-six feet.

Commissioner Francis. That is the theoretical horse-

power, I suppose?

Mr. Hodges. Yes, sir; the theoretical horse-power. In this matter making no allowance. I think I shall explain that in a few moments to the satisfaction of the commissioners. The next smallest month is October, when there was 60 horse-power; the next is November, when there was 65 horse-power; the next is July, when there was 125 horse-power; the next is July, when there was 125 horse-power; the next is August, 156 horse-power; and December, 166 horse-power. The others very abundant, 1100, 800, 700, 900 and 600. The next year — and again I would remark that we are dealing with years where the rainfall is, by the showing of the city, six inches upon the average less than the nineteen years preceding—the next year the rain-

fall is 45.49, and that year the smallest flow was in January. The testimony will show that it was not taken until February or March with substantial accuracy. In January, the horse-power was only 37. The next lowest month is again September, when it was 73, and then, not to detain you with the details of these figures, then follow 114, 140, 230, 208, 500, 500, etc. In 1876, down until past the middle of September, the lowest months there are September and July, in which the average is 66 horse-power; June, 78; August, 143; and from that upward; January, 229.

Now, gentlemen, from these very figures, taken by the parties in behalf of the city, it appears that in three exceptionally dry years, in a semi-decade, six inches less than the average, there is furnished to my client nearly all the power he has claimed before you he had. Our claim is that we have and employ 335 horse-power for between eight and nine months in the year in the daytime, and that we employ in the night-time about fifteen per cent. less. I say employ,

that is, we have and have employed.

The three and one-half months remaining furnish us with power for Mill No. 2, requiring 85 horse-power. If there are days during an excessive drought when this power is not supplied, there will be other days during these months when Mill No. 1 can run, and thus make up the average. So that these measurements do not derange our claims — based as our claims are upon the rainfall as it averages for twenty years — which will fully supply the power for Mill No. 2 in the three dry months. Take twenty or thirty years together and you will find those measures taken by the city do not in any respect depreciate the value of the testimony we have taken, or substantially attack the positions upon which we

rely.

I was about to speak, when I commenced to comment upon the tables, of this better quality of proof that the witnesses spoke of, viz., actual measurements for a long series of years, which they regard as better data than rainfall and watershed. We have commenced in 1829, and shown measurements made from that day to this by witnesses who dealt with the subject-matter, who gauged the amount of power by actual use, and who certify what power we derived and utilized from the water. I do not desire to repeat that or comment upon it beyond calling your attention to the fact. Just here, responsive to the suggestion of Mr. Francis, I would say that I do not refer to or deal with the theoretic but the absolute power, because the proofs we have introduced for the most part bear upon the amount of power applied to our shafts, and not to the theoretic power

on the wheels. Mr. Webber measured the power required to conduct our machinery; and you will bear in mind that it demands 335 horse-power, — 325 as measured by him, and it was estimated by the witnesses that there was ten more that he omitted to measure, making 335 horse-power required by the machinery in use. We showed you that the machinery in our mill was as substantially carried, before the taking by the city, by water for the times we have The old machinery carried by water required less power than we now need by about 50 to 75 horse-power; but that is more than compensated by the addition of four feet to the fall and the use of turbine in place of the three old breast-wheels. If that is made clear, I have no desire to proceed further with that point. I think that the absolute proof of machinery run by water in our mills justifies us in asserting, not as matter of theory, but as matter of proof, that we run our mills eight and a half to nine months in the year by water, and in this wise. All the mills up to eight and a half months, the lesser mill, No. 2, requiring 85 horsepower, we run substantially the rest of the year. In other words, we can run Mill No. 1, requiring 240 horse-power, eight and a half months in the year, and Mill No. 2, requiring 85 horse-power, the whole year; and that is our claim for which we ask you to pay, — this, too, exclusive of our claim for the use of the power by night. We further assert, in response to this testimony introduced on the part of the city, that our coal record, or, more properly speaking, our record of the uses of our machinery since the record was kept, exactly supports this assertion. I refer to pages 336, 7, 8 and 9 of the record for some tables and problems that I wrought out in explanation of this position. I ask your attention for a moment to what might, unexplained, be misleading, on page 339. At the end of paragraph No. 3, on sheet 4, where I undertook to deduce the whole power for twenty years by comparison with this written record, and I endeavored to state that our machinery was run $\frac{11}{15}$ of the time by water and $\frac{4}{15}$ of the time by steam, it is so printed that I am not sure that you will understand my work. If your Honors will take a minute of that place, you will observe it when you come to see it - page 339, the end of paragraph No. 3, and just above the place where "problems" is first printed. You will observe, Mr. Russell, "water 11.15, steam 4.15." They were written, and intended to be placed, the 11 over the 15 and the 4 over the 15. It is the result which the calculations made justify, and, I venture to say, they are unanswerable. By those calculations, I think I demonstrate that for twenty years we run our machinery by water

 $\frac{11}{15}$ of the time, and by steam $\frac{4}{15}$ of the time; that is to say, that such would have been the result if a record had been kept during the fifteen years prior to 1870, and the results had been measured by and corresponded with the rainfall of those years. I took the rainfall of the whole twenty years and averaged the power produced, and estimated our work by a comparison with the figures of the record which we kept, and to that comparison and the deduction drawn from it I have seen no answer of any kind. Now, we say with these witnesses, — men employed on the waterfall for nearly fifty years, and this record of the use of water and steam, we present to you measurements for "a long series of years," measurements that the city experts say are more reliable than any calculations of theory. True they are not witnesses, employing mechanism designed only for measuring water by the drop; but they are witnesses who, with machinery that does measure the drops of water, — machinery that they are expert in, with which they have gauged this power, as with it they have earned their bread, — and they have given you the best of their judgment. You will bear in mind, gentlemen, that we, thus measuring this power as it is applied to our shafts, casting aside all allowances for theoretic horse-power, show you what we do with the water, and ask you to give us something that will do the same. We likewise take but little notice of the theories and statistics of the water in the dry months in distinction to the general annual average. In those months we only claim for the use of Mill No. 2. We use Mill No. 1, requiring 240 horse-power only for about eight and a half months, leaving three and a half months of the dry months to come, in which we use the second mill. For that we have, upon an average, 85 horse-power.

Now, gentlemen, referring to the decision of the commissioners concerning the proof of what the city is to use hereafter, and when they are to use it, not proof of what they intend to use, but keeping within the law as expounded in Dickinson vs. Fitchburg, and inquiring what, in the ordinary course of events, it is supposed they will use, and I feel it necessary for the protection of my clients' rights that I detain you a few moments. I will commence by saying that on the part of the petitioners we say you are to treat this subject as if the city took the whole water from the day the paper was filed in Middlesex Registry, and we recognize

no qualification to that.

Mr. Butler. Not even the million and a half gallons? Mr. Hodges. When I said no qualification, I meant in reference to the other parts of the question, General Butler.

The million and a half is open, as I understand, only to the question whether that does not run for the protection of the city against complaints for creating a nuisance; but I shall submit, with as much grace as I do to anything, to the decision of the commissioners on that subject. As I understand the case of Dickinson vs. Fitchburg it means simply this: that where the Commonwealth grants out its eminent domain it does it always with a specific purpose. The agent to whom it commits its power is not authorized to deal with it at will. It is not a roving commission, that authorizes this agent to take the property of the citizen and deal with it just as he chooses, but, on the contrary, it is an authority for him to take for a specific purpose a piece of property, and for that specific purpose the agent may use it, paying the damage; and the damages are measured by the specific purpose, and that is all. For example, when the City of Fitchburg is under the law authorized — certain conditions being granted - to take a piece of land for a highway, it is not by law authorized to appropriate that land for a slaughter-house. When the citizen asks for compensation for the land, the tribunal to whom the question is submitted — in this case you, gentlemen — don't look at the land taken by the city, and say, "Now the city may build a slaughter-house there, or erect any other nuisance, to the injury of this man's other land;" but you open the commission the Commonwealth has granted to the City of Fitchburg, and see in it that the city may take that land for a highway; and then, gentlemen, you estimate how much the highway will injure the party whose land has been taken, and upon whose land the highway borders; and it is simply with the view of ascertaining the purposes for which the land is taken that you open the commission, and it does guide and should guide in assessing the damages. But let us pass a little beyond this and suppose that it is meant under that decision that you gentlemen are to look into the supposed purposes of this highway. Is it your business again to throw the light of prophecy upon time, and say, Fifteen years hence that highway will be used for carriages of gentlemen, and twenty-five years hence it will be used for market-carts, and twenty-five years beyond that it will be the way through which the citizens of Fitchburg will transport the city offal, and adjust damages accordingly? No, gentlemen, you are simply to say what is the purpose for which the City of Fitchburg takes that land; they take it for a highway, and no more. Now, gentlemen, that case might be likened to this, and so likened to it as to rule this, if it had been in this wise that the City of Fitchburg asked the tribunal to deal with the question. Suppose

they had claimed that they had taken a strip of land, four rods wide, for a street; for the present there was no need of a street at all, they now wanted a sidewalk only, and it was all they should then build; they had taken the whole land, but all they should do for the present would be to build a sidewalk on the side opposite the petitioners' land, and upon such representations had asked the tribunal to consider, in assessing damages, that for twenty years the city would not build a highway there; they could not, in the nature of things, need one before that time; at the end of twenty years we cannot need a highway beyond a certain point; in twenty-five years a certain point beyond; and so on until the whole land taken is in the remote future made into a highway; but inasmuch as we foresee we shall ultimately need it, we condemn it now, and expect to pay for it damages calculated from the dates of our probable construction of the road. Would the Court, would you, gentlemen, for one moment take requests of that kind into consideration when you are estimating the damages? Why, certainly not; it is not reasonable.

Perhaps I may be permitted to illustrate this another way — certainly it will be a more satisfactory expression of my Suppose the city takes a portion of land for a park, - a portion of my land, - leaving me another portion, and when I ask for damages they say, "We have taken 3,000 acres of land for a park, including yours and the land of a hundred other citizens. Now, it is perfectly obvious, from the course of events, that we shall begin our park at the water-side in Dorchester, and the construction cannot reach your place for fifteen years, and until then we will neither fence in your land nor deny you the privilege of doing anything you choose; 'you may enjoy its use as owner; you may pasture it with geese, if it suits your pleasure." Is that to be considered in estimating our damage? Let us see where the right would be. The city takes our land to-day, and says this in opposition to our claim for damages. In the mean time the city goes on, increases the value of this property, and at the end of twenty years the property is worth four times as much as it would be estimated to be worth to-day. The city has availed itself of the right to take our land at prices to-day and reduce our prices by interest or in any other mode by which the tribunal may reduce it, by the assertion that in all probability it will not deprive us of the use of it for some years to come. Now, gentlemen, it does not seem to me that such would be the course of logic of any tribunal in the world who are called upon to estimate damages for property taken under eminent

domain, or otherwise in invitum. I repeat that, in my judgment, the case of Dickinson vs. Fitchburg does not rule our case if interpreted in any other way than this, viz., the tribunal will inquire for what general purpose the eminent domain is exercised, but not how it is to be exercised. It will judge whether land is taken for a highway, a school-house, a city hall, or a fort, but will not inquire when either is to be constructed or the details of construction. It will assess damages in view of the subject or purpose for which the power is granted, without regard to the manner in which it may be exercised or the times when its exercise shall be perfected. The tribunal will open the power of the city and see that it takes that land for a highway, and doesn't take it for any other purpose, and assess damages accordingly. this there is no supposition concerning the future; there is no burden of forecasting thrown upon the commissioners; they have to estimate the value of the thing at the present time of the hearing.

But suppose the city is right in its view of the law, and that you are to inquire when and how the city is to divert this water. Let us for a moment consider what you are to believe to be the uses to which the city are to apply the right that they have taken from us, and, in doing that, bear in mind that it is the right that the city has taken and the right that you are to estimate. Now, what ' are we to suppose, - placing ourselves in the position of prophets, — when are we to suppose the city is to divert this water? - and we start with the admission that the city has taken the right to take the whole of it, always excepting the million and a half gallons. The city has asserted the right, and under the law has the right, to take the whole of it at any moment. She is laying out a great deal of money with the view of utilizing that right, and she comes here professedly willing to pay to my client the value of that right. We then deal with it as if the city had a right, which it had paid for under your judgment, and in the use of which it had expended a great deal of money. Now, will they not, to the best of their ability, employ that right to a profit? Are we to believe that the city has done all this without the purpose of gaining what it may? Why, gentlemen, if the city only wanted twenty, or thirty, or forty millions of gallons of water a day, why didn't they have an act that authorized them to take such quantity from Sudbury river, and to pay for it, and there stop? They can measure the forty million of gallons that runs in their aqueduct as well as measure the million and a half that runs in the natural channel of the river, and if it was no purpose of theirs to take

the whole of this water, and if they don't want it for forty years, why be at the expense and the trouble of getting from the State the right to take it? Is it reasonable to suppose that they have been at all this trouble and expense to get

that right without any purpose to use it?

Again, gentlemen, Boston has to-day undoubtedly water enough to last for years with the natural increase of the city, if used only for the purposes of health and cleanliness; but the city has found a profit in furnishing water to steam engines, it has found a profit in furnishing it to various mechanical uses, and it proposes to go on and earn more like profits. Do we unjustly interpret the motives that will rule the city in the future, when we assume that this water will be sold here for mechanical purposes when the higher demands have been satisfied? The city will deal with this water as reasonable men deal with property they have pur-

chased, — they will utilize it as best they may.

May we not approach the "ragged edge" if we too closely adhere to the theory of the city? It is the common law of bargaining for the purchaser to depreciate the purchase; here, in obedience to such ethics, the city asserts the improbability of her taking the water to our injury for half a century. If you accept that as fact, and diminish the award accordingly, the city will have made its bargain, acquired its property, and will proceed to use it. It would be a glaring injustice should it result that next year the city took all the water, for much of which they had not paid, and here sold it to my clients, for mechanical purposes, at rates many fold exceeding the price we are soliciting you to decree to us. Yet such is not an improbable result if you accede to the views urged by the city. It does not harmonize with the usual courses of the law to rest a claim for damages upon prognostication of future use; but if it does so rest in this case, then I insist that we must assume the city will employ this power or right in such manner as to make the most profit from it, and that profits will accrue soonest and in largest amount as they shall earliest and most exhaustively divert the whole water. If, then, you are to make supposition of what the city will do in the nature of things, we believe you will suppose it will take all this water as soon as possible. If this looking into the future tends to diminish the estimation in which you hold the rights of my client, whose property has been taken without his will, I trust you will not act without assurance that your prescience is right. And here again I assert the position that I originally took, that the city stands in the position of the spoiler, —it is taking in invitum the property of the citizens, and it does not

stand, as was so amiably and happily stated by my brother Shattuck, it doesn't stand as a sovereign. When the city takes a piece of my land (in the city) for any of the thousand purposes that the patron, the father, the sovereign, requires property in the protection of its citizens, it is the case of the sovereign taking the property of one of its corporators, one of its children, one of its subjects, for the general good. But the City of Boston and the Saxonville mills are alike artificial citizens of the Commouwealth of Massachusetts; and the Commonwealth gives to the City of Boston the right to lay its hand upon and to deal with the property of its own citizens for their own protection, as the sovereign or father deals with subjects and children. But the right to reach its long arm and take the property of my client, situated in Middlesex County, is not the case of the sovereign dealing with his subject, or the father with his It is clothing one citizen with the power to take the property of another against his will, and it can be reconciled with right and justice only when the power is charged with the condition that there shall be furnished to the citizen a judicial tribunal, at once impartial, intelligent and fearless, who shall pass upon and award his just compensation. Using the word in no offensive sense, it strikes me if the spoiler ever went forth in this world, it is when the city reaches out to another district to appropriate the property and the fortunes of the citizens. We owned this water; the city has taken it from us; has withered the right hand of our growing profitable and useful industry; we look to you for compensation, and trust that you will see that while our claims are very large, our damages are larger. that you can award will replace our establishment in the secure, constant and generous activity in which it was working when the city appropriated its vital energy.

One word more and I shall be done. In making the estimate of the value of steam-power we took the testimony of Mr. Bacon, who fixes it, as you will remember, at \$75. I have carefully gone over the testimony that has been taken since, and endeavored to view it, as I would ask men to view my own affairs, under such circumstances, and it seems to me that, in the position of my clients, the risk they run as to the price of coal, and all the proofs bearing upon this subject, \$100 per horse-power is the lowest sum with which we can supply this power; and be it understood that in so estimating I consider the difference between an engine of 350 horse-power and one of less; as the engine is larger so you produce horse-power for a little less money, after you reach that grade of engines that requires at once a good

engineer and fireman; when you get up to that, where both of those are required, as you increase the horse-power you diminish relatively the expense. All that I consider; but in view of all the testimony it seems to me we should have awarded to us \$100 for horse-power. I only make this statement, because, when I originally presented it, I entertained different views, and would make no claim that I did not think a fair one. If, in view of the testimony that is before you, you are of opinion we are entitled to this increase in the damages, we shall ask you to give it to us.

I believe, gentlemen, that closes what I have to say. In making the estimate for the Saxonville Company I would ask you to bear in mind the views we expressed in the original case, that we were entitled to our damages for being deprived of our water at night as well as during the day, for

what it is worth.

ARGUMENT OF L. M. CHILD, ESQ., AS TO THE TITLE IN BELVIDERE MILL, No. 1.

As I have examined this title here, the title is divided into two classes; the original owner of it, as appears by the title as put in, is Thomas Hurd, who owned the land on both sides of the river, and owned all the water-power, therefore. 1821 he conveys to Winthrop How certain land, - which I do not propose to say anything about, - with the privileges thereunto belonging," except the mill privilege, where the old saw-mill now stands, the said Hurd reserving to himself, his heirs and assigns, a right to erect and maintain a dam across said river above said saw-mill, where the dam now stands;" "and also a right to draw and use the whole of the water of said river above said dam, at his the said Hurd's factory, on the west side of said river." And on the same date, there was an indenture between Hurd and How containing this clause: "Convey unto the said Winthrop How, his heirs and assigns forever, a right to build any mill or mills on the east side of Concord river below the mill-dam running from said Hurd's factory on the west side of said river to the easterly side thereof; also a privilege to draw and use the water from the mill-pond above said dam for the purpose of carrying said mill in common with saw-mill or mills, the said Hurd reserving to himself, his heirs and assigns, the first and exclusive right to the use of sufficient water from said pond to carry a fulling-mill and three breastwheels"—

Commissioner Russell. Where was the saw-mill privi-

lege — on which side?

Mr. Child. The saw-mill privilege was on the east side. Now, we claim that there never was any grant of the saw-mill privilege by Thomas Hurd. The deed made on the 31st of May, 1821, expressly reserves the saw-mill privilege. An indenture made on the same day gives the right to Winthrop How to draw water from the mill-pond, but reserves the exclusive right of Thomas Hurd to use the water on the west side of the river for his fulling-mill and his three breast-wheels, therefore leaving it in this condition, that the saw-mill on the east side and Winthrop How, the grantee of Thomas Hurd, have a right to use the water in common, but neither the mill privilege nor Winthrop How have the right to use the water when Thomas Hurd doesn't have enough to carry his fulling-mill and his three breast-wheels.

Commissioner Russell. You claim, under that deed and indenture, that the saw-mill and Winthrop How have a right to use in common the water on the east side?

Mr. Child. Yes, sir; when there is more than enough to carry the fulling-mill and the three breast-wheels. That is, that there was no intention on the part of Thomas Hurd, having made a deed on the same day in which he expressly reserves the saw-mill privilege, and there cannot be found anything in that indenture which conveys away the saw-mill privilege to Winthrop How, but it simply gives to Winthrop How the privilege of building any mill he likes on the east side of the river, and using any amount of water he likes, together with the saw-mill, up to the point where there is not enough to do more than to carry the three breast wheels and the fulling-mill.

Commissioner Francis. Allow me to ask if the saw-mill privilege and mill were situated on the land conveyed, or

not?

Mr. Child. "Excepting the mill privilege where the old saw-mill stands."

Commissioner Francis. If the mill didn't stand on the land conveyed it would be a little different question.

Mr. Butler. I don't think it did stand on the land conveyed. It stood down below, I think.

Commissioner Francis. Yes, sir.

Mr. Butler. The point being that it left the water on the east side in the joint use of the saw-mill and of How's mill when there was more than enough for three breast-wheels and

a fulling-mill.

Mr. Child. Now, by this deed, Thomas Hurd conveys a certain tract of land near the mouth of the Concord river, containing ten acres, "beginning at the northeast corner of the said Concord river, by the land of Edward St. Loe Livermore, Esq., thence running south 5° east 29 rods of land of said Livermore 29 rods to the road leading to Tewksbury; thence crossing said road to the end of the fence; thence south 7° east 5 rods; thence south 1½° west 13 rods; thence south 163° west 9 rods and $\frac{5}{10}$; thence south 66° west 5 rods and $\frac{8}{10}$; thence south 29° east 5 rods and $\frac{2}{10}$, to said Concord river; thence down said river to the bounds first mentioned, with the privileges thereunto belonging, excepting the mill privilege where the old saw-mill now stands, the said Hurd reserving to himself, his heirs and assigns, a right to erect and maintain a dam across said river, above said saw-mill, where the dam now stands;" so that I should suppose it did stand on the land conveyed.

Commissioner Russell. Or at all events the saw-mill privilege is specified as belonging to the land conveyed.

Mr. Child. It says with all the privileges thereunto belonging, except the mill privilege. That is, if the mill privilege hadn't been excepted, on the construction of that deed it would have carried it.

Mr. BUTLER. It would have carried it, because this land was both above and below the dam; therefore, he had to retain a right to the saw-mill and the dam, and reserve the right to the saw-mill.

Mr. Child. I don't think it followed from that deed that the saw-mill was on the land; but the mill privilege was on the land, and he reserved the right to get water for a saw-mill below. It is the privilege to a saw-mill somewhere.

Mr. Butler. "With the privileges thereunto belonging, excepting the mill privileges where the old saw-mill now stands, the said Hurd reserving to himself, his heirs and assigns a right to erect and maintain a dam across said river, above said saw-mill, where the dam now stands; and also a right to draw and use the whole of the water of said river, above said dam, at his the said Hurd's factory, on the west side of said river." Then came the other indenture.

Mr. Child. What we claim is, that he reserved a right to draw water from this pond on the east side, sufficient for a saw-mill in his deed; that when he made his indenture he gives Winthrop How the right to build any mills he likes, and use any water he can get in that pond, in company with the saw-mill; but he cannot use any at all when he needs it from the west side of the river. Now Winthrop How conveys to Abraham How and to Windsor and Jeroboam How a grist-mill and mill privileges, etc.; and then Abraham How and Windsor and Jeroboam How convey what they get to Daniel T. Curtis, and he conveys to Warren, Barry & Park; so the first part of this title gets this property in the hands of Warren, Barry & Park; that is, to the land on the east side of the river, and of the water on the east side of the river, with the exception of this saw-mill privilege. Then Warren, Barry & Park are the ones who make a great many small conveyances; and the first conveyance they make is to William Eager, January 2d, 1832, and they conveyed to William Eager "no more water than will run through said Holmes' present gate (which is ten inches wide) when the same is lifted or open two and a half inches, and no more." That is, they conveyed to Eager the right to use, subject to this Middlesex Company's right for the factory and fullingmill, water through an aperture ten inches wide, and two and a half inches high, or through a gate which is ten inches

wide, and two and a half inches high. That was the right of water conveyed to William Eager. Now, in order to maintain the claim of the Belvidere Company you must find that that is $\frac{1}{25}$. Eager's claim is called afterwards, in some of the conveyances, $\frac{1}{25}$. We claim that it did not appear there was $\frac{1}{25}$.

Commissioner Russell. This is part of what goes to the

Belvidere, and not what is excepted?

Mr. Shattuck. Yes, sir.

Mr. Child. The importance of that is that it is claimed here that the $\frac{25}{25}$ comprise all the water there is left after the three breast-wheels and the fulling-mill. Now if $\frac{1}{25}$ is $2\frac{1}{2} \times 10$ then $\frac{25}{25}$ is twenty-five times that amount of water; and if there is water over and above that, it doesn't belong to the Belvidere Company. That is the point.

Mr. Shattuck. The other deeds describe it as 1/25 part

of the whole matter.

Mr. Butler. The difficulty is you only get it by twenty-

fifths, and they say what they mean by a twenty-fifth.

Mr. Child. There is nothing in this title that shows that the $\frac{1}{25}$ of the water was $\frac{1}{25}$ of all the water; but the next privilege they grant, or one of the next, was to Alpheus Smith, of "six twenty-fifth parts of the water of Concord river at the premises in common with said Warren, Barry & Park, their heirs and assigns; but this right is to be exercised subject to the previous rights following; that is to say, only when there is sufficient water for the Middlesex Company's right, and also for the works of the flannel-factory and fulling-mill owned by us near the premises, as said works now are." That is, it is subject to the Warren, Barry & Park's mills; and sufficient for their works these twentyfifths are. Then Warren, Barry & Park sell out fourteen shares of that sort, and then they sell all they have got left to the Belvidere Woollen Company. They first measure $10 \times 2\frac{1}{2}$; they call it a twenty-fifth –

Mr. Shattuck. They don't call the Eager portion a

twenty-fifth.

Mr. Butler. Yes, they do.

Mr. Shattuck. No, sir; not Warren, Barry & Park.

Mr. Butler. That is a question of fact, and it had better be determined by the deed.

Mr. Shattuck. Yes, sir; that is a question of fact, and we will have no controversy about it.

Mr. Child. That is the first conveyance, Warren, Barry & Park to Eager, $10 \times 2\frac{1}{9}$.

Mr. Shattuck. I have no doubt at that time that they

had a general idea that that was one twenty-fifth of the whole

available part of the water.

Mr. Child. I claim from reading of the deeds it appears that it was the intention of Warren, Barry & Park to call $10 \times 2\frac{1}{2}$ one twenty-fifth, and what they sold, and when they sold six twenty-fifths they sold it for an amount six times as large as Eager's, and that they kept back for themselves all the balance of the water, whatever it might be.

Mr. Shattuck. Oh, no, sir.

Mr. Child. That Warren, Barry & Park did.

Mr. Butler. What they said was this: "The above lots contain in all 15,768 square feet of land, more or less, with all the privileges and appurtenances to the premises belonging, particularly the right to use six twenty-fifth parts of the water of Concord river at the premises in common with said Warren, Barry & Park, their heirs and assigns; but this right is to be exercised subject to the previous rights following; that is to say, only when there is sufficient water for the Middlesex Company's right, and also for the works of the flannel-factory and fulling-mill owned by us near the premises, as said works now are, or with the substitution of an iron-wheel similar to that in the Middlesex Company's wooden building, and also for the works of Holmes' card and whip factory."

Mr. Child. Holmes' card and whip factory is Eager's.

Mr. Butler. "Reserving, nevertheless, to us and our heirs and assigns the unmolested right forever to have a canal running through the premises, the same with, or simi-

lar to, the present canal there."

Mr. Child. That is, what we claim shows that this twenty-fifth was this aperture. Of course, if it was a twenty-fifth, it would not be a stationary quantity, but it would depend upon the amount of water; but this six twenty-fifths of Smith's is subject to Eager's $10 \times 2\frac{1}{2}$. Therefore I say when they sold six-twenty-fifths to Smith they sold him an aperture six times that size, subject to Eager's aperture. Eager was first, and he second, and so on. Warren, Barry & Park then proceeded to sell, subject to various parties, as set forth on the 928th page: first, as I have stated, to William Eager, with the Holmes' card and whip factory; second, to James Stewart, and another $\frac{1}{25}$; third, to Abijah Brown, and another $\frac{1}{25}$; fourth, to Hale Clements $\frac{3}{25}$; fifth, to J. G. Kittredge $\frac{3}{25}$.

Now, of those conveyances which I have read, I will state what came back to the Belvidere Company: William Eager's comes to the Belvidere Company; Hale Clements' comes to the Belvidere Company; Alpheus Smith's

comes to the Belvidere Company, with an exception; and that is all that comes to that company, and I will call your Honors' attention to the exception. On page 931 is the conveyance of Alpheus Smith to Seth Ames and George Brown, Nov. 28th, 1835, in which they convey to Seth Ames, "being the same premises which were conveyed to me in October, 1832, by Warren, Barry & Park, except so much thereof as I have heretofore conveyed to Hazen Elliot and Abner Ball." Now Hazen Elliot's part comes back to the Belvidere Mills, but Abner Ball's part is still outstanding. That reservation of Abner Ball stands between Alpheus Smith and the Belvidere Company, so that it stands in this way, that the Belvidere Company can get back all these twenty-fifths; with the exception of five, they all come back, although subject to Abner Ball, and subject to J. D. Sturtevant. On the 932d page, the Whitney Mills to Baker, Hill & Farnsworth, the "same lot of land as was conveyed by Warren, Barry & Park to Alpheus Smith, by deed dated Oct. 1st, 1832, excepting so much of said lot as lies on the north side of a line drawn across the same, parallel to the north side of said building, and distant from the same four feet; with all the privileges, appurtenances, waterrights, etc., as in said deed to Smith, subject to right of J. D. Sturtevant in water and canal across said land, as conveyed to him by deed, dated April 2d, 1844."

Now I will recapitulate a little. Warren, Barry & Park had the whole of this property less the saw-mill right. Warren, Barry & Park conveyed away 14 to various parties; and the remaining 11/25 they convey to Baker, Farnsworth & Hill. Of the $\frac{14}{25}$ nine twenty-fifths came back to the Belvidere Woollen Company subject to Abner Ball and J. D. Sturtevant and to a conveyance of $\frac{1}{24}$. I don't state positively here that J. D. Sturtevant's interest did not get back to the Belvidere Woollen Mills, but I claim that it does not, and I ask you (Mr. Shattuck) to show that. Therefore I do not state that J. D. Sturtevant's is still outstanding, but I claim it is still outstanding. I assert that Abner Ball's is still outstanding and the saw-mill privilege. Now of the $\frac{25}{25}$ 18 come to Farnsworth, Baker & Hill; then Farnsworth, Baker & Hill convey away $\frac{1}{25}$ and $\frac{1}{24}$; they made a new departure and instead of calling it twenty-fifths they called

it twenty-fourths.

Mr. Shattuck. Only in one instance.

Mr. Child. Only in one instance. That is, they conveyed $\frac{1}{3}$ of $\frac{1}{24}$ to one man and $\frac{2}{3}$ of $\frac{1}{24}$ to another man, so that it leaves the property (which came from Warren, Barry & Park, who owned the whole of it, subject

to the saw-mill) in Farnsworth, Baker & Hill, amounting to $\frac{1}{2}\frac{7}{5}$ minus $\frac{1}{2}\frac{1}{4}$, subject to Ball and Sturtevant. Farnsworth, Baker & Hill then convey their rights, viz.: $\frac{1}{2}\frac{7}{5}$ minus $\frac{1}{2}\frac{1}{4}$, to the Belvidere Woollen Company. The same company also secures Hale Clements $\frac{3}{25}$. So that the amount of waterpower owned by the Belvidere Woollen Company is $\frac{20}{25} - \frac{1}{24}$, subject to Abner Ball's right and the saw-mill privilege. The respondents claiming that the twenty-fifths are not the whole surplus water, but only the amount of water running through an aperture 10 in. \times $2\frac{1}{2}$ in. There is in one or two of the deeds, "subject to the covenant with Smith;" but I believe that Smith's covenant was simply the right to allow a canal to run through the land, and that it was not any covenant in regard to taking of water.

There is one other thing that I desire to call your Honors' attention to, and that is, that in the conveyances a large portion of these water-rights went through the Whitney mills. In the Whitney mills, in one of their conveyances at least they say, "with the privileges and appurtenances thereto belonging," without saying anything about the water. Whether that carries the water or not is for you to decide.

Mr. Shattuck. That is the Clement and Smith deed, to which I referred the other day.

Mr. Child. In one of their deeds they conveyed it in that way without saying anything about the water at all.

Commissioner Francis. What has become of the saw-

mill privilege?

Mr. Child. The saw-mill we claim. If the Middlesex mills have got any water-rights on that island at all it is that saw-mill privilege, and they have always claimed it. They have been in possession of it from that time to this, and have always used it, and have always used their share of the water.

Commissioner Russell. Do you mean that they have not any other rights?

Mr. Child. We mean on the east side of the river on that island.

Commissioner Stevens. Was that island included in the land?

Mr. Butler. The island always stood by itself. What we claim is that we have got the balance of the saw-mill privilege and we call that $\frac{7}{16}$, and when we come at the city we shall come for the $\frac{7}{16}$ which remains on that side.

ARGUMENT OF GEN. B. F. BUTLER.

May it please the Commissioners:—It becomes my duty now, in behalf of the city, to make a few observations to you upon what I deem to be the true position of this case, and, in so far as I may, bring to your minds the various claims of the different petitioners as they appear on each other, and the rights of the city. I have never troubled you, and shall not now, with any compliments upon your learning and ability, because I never pay compliments where none are needed, and, beside, if you should make any mistakes there is another tribunal to correct them. I assume that you will bring matured judgment to the consideration of the matters before us, and I am sure that you have given the most careful and the most thoroughly patient attention to them; nor do I think it is correct, in any view of the case, to say that the city stands in odium spoliatoris. I don't believe that applies to us at all. My own view is that the city stands, as the agent of the Commonwealth, to do a great public work for the benefit of the Commonwealth; for the larger portion of the interests of the Commonwealth are bound up in the prosperity, health, and growth of the commerce of the City of Boston, and it is in aid of that prosperity, health and growth that this proceeding is undertaken.

Another observation I may be permitted to make, that this question is one of very vital importance, because the whole Commonwealth, its several villages, have got to look to the ponds and streams for pure water for the maintenance of health and cleanliness and the domestic uses of their inhabitants; and if it is to be predicated that every stream is subject to a prior right in a mill-owner, so that it is not possible for the inhabitants living on that stream, or any other inhabitant of the Commonwealth, to take a single drop of water, as theoretically it is claimed to be, without paying damages, then a very onerous burden is to be borne by the tax-payers of the Commonwealth. And more than that, if very exorbitant damages are to be given and very exorbitant claims allowed, if anything like what is claimed here wherever the claims have been formulated in figures, as in the case of the Saxonville and the Sterling mill and the Schneider mill, which are the only three, I believe, where these

claims have been put into figures — Mr. Shattuck. I think you will find the figures in each

case. Judge Abbott put them in in his, and Mr. Merwin in

his.

Mr. Butler. I am judging by the record; and I speak with some confidence because I have tried to get it in every case, and I don't remember how many hundred thousand dollars Mr. Simpson claimed —

Mr. Shattuck. I don't know that you care to refer to it, but there is an exact statement in dollars and cents of Mr. Faulkner's and Mr. Talbot's claims, and Mr. Merwin also put

one in; but I don't wish to interrupt you.

Mr. Butler. I am much obliged. But that was put in the table, and I am sorry to say, in my view of the case, that, among the few of these tables I have read, I haven't seen that; but what was said in argument, I was dealing with—Then I will add—Simpson, I don't know how many hundred thousand; Talbot, \$150,000; Faulkner, in his mill, \$36,000; "and add to this sum part of the cost of a new engine and a larger one; add some part of the winter stopping, and add some part of the liability for breaking down," which is a pretty indefinite claim. Then, next, the Sterling mill, \$45,000; then comes Schneider's mill, \$60,000. I say now, with all gravity, that if anything like this is to be given in damages, then, in my judgment, it is an entire departure

from any rule of law.

It is to be remarked that no one of these gentlemen state their claims in their petitions, and there is no evidence that any one of these gentlemen have ever made any claims upon the city for damages, or given the city any opportunity to agree with them. That, I think, is the evidence as I understand it, and I believe you will so understand it. I think while I am upon this subject it will be perhaps the best illustration of the entire enormity of these claims if we deal, by way of illustration, with the Sterling mill, because if there ever was a claim that cannot, upon any possible view of it, be supported, it is that claim of the Sterling mill. Now, in the first place, let us see what the title to the Sterling mill is. In the first place, Mr. Whipple, being owner of a mill-dam and water-power, conveys to Joshua Mather, by his deed, dated May 18th, 1857, — he sells to Joshua Mather the entire premises on which the Sterling mill is situated; and also when there is in the river a quantity equal to 288 cubic feet, one-eighth of that quantity for eleven and a quarter hours a day, for six days in the week, and the consideration of all that land, the mill-right and the water, is \$1,500. That went in to Mr. Mather. Now, Mr. Mather held that property until the ninth day of July, 1864, and did nothing with it, because he leased it on that day for fifty years, with the privilege of a fifty-years' renewal, to Charles A. Stott; and Charles A. Stott is to build the mills

upon it, as shown by the lease. In 1864, for fifty years, with the privilege of renewal, under these conditions:—

"If, when said new and further lease is given, either of the two parties then holding and owning the interests of, and representing the said Mather and the said Stott under this lease, shall require or request a new valuation of said premises, then the said parties shall each choose one person, who shall be a well-qualified and experienced manufacturer, and also a superintendent of, or owner in, one of the principal or large manufacturing establishments in said Lowell, and they two so chosen shall choose a like third person, and the three so chosen shall, under oath, appraise the then value of said premises as hereby leased (the real estate, land, mill-privilege and water-power, but not including buildings, structures or improvements hereafter made);"—

Because the lease was that Stott was to build the buildings —

"And if six per cent. interest for one year on the sum at which the same shall be so appraised shall be greater or less than fourteen hundred dollars, then the annual rent for said further or second term shall be fixed or ascertained by taking fourteen hundred dollars, and adding thereto such excess, if any, or subtracting therefrom such lack or deficiency, if any, and the sum or remainder, as the case may be, to be the amount of annual rent to be paid in said new lease or further lease, instead of fourteen hundred dollars as in this, but fourteen hundred dollars to be the annual rent in said new lease, if neither party shall require or request a new valuation."

Now, then, having these premises, he leased them for six per cent. on a sum which would make \$1,400, land and everything but the new building, and he fixed that as the worth of that in perpetuity for a hundred years, except it might grow more valuable. Now, what does the Sterling mill get? It gets the right to this by paying an annual rent of \$1,400. It gets all this land, all this water-power, the whole thirty-six feet, for a rent of \$1,400; and for taking one-fifth of it, - for that is the worst that can be said, -which costs them a fifth of \$1,400 a year, they desire us to pay them \$45,000! The whole was bought for \$15,000, rented to them at \$1,400 a year; they have got to pay \$1,400 a year. We subtract from their rental (and I don't know whether the whole matter - but that is a question for you to consider — whether the whole matter is not for the landlord and not for them; I have raised that point) only that which costs them so much money, and will not cost them any more money or any less for the balance of a hundred years, and they want \$45,000! Now, then, just here,

what is the rule of damages? Why, no two lawyers of any considerable practice at the bar can differ as to the rule of The rule of damages is the difference in the market value of the property injured between what it would have been before the taking, and what it is after the taking; and all these measurements, and all these estimates, and all these calculations which have been gone into only are valuable or admissible as throwing light on that question, and that question alone. There is no claim in law that we should replace this water by steam, any more than there is a claim that we should supplement the power taken away and give them some which is applied by electricity; but the steampower is used as an illustration of how it might be supplied, and showing one element of what might be the change in market value. Now, then, with that loss of \$1,400 a year to the Sterling mills, would you make a difference in that power, in that matter for the water-power alone; for the building is not injured? If you were going to buy that lease, would you make a difference of \$45,000, considering the change? If you would, why, be it so; then I am done. If I thought you would, I should sit down very flat, and not say another word. It seems to be so preposterous. Think of it a moment. The whole power, land and all, cost in 1857 —; when it was let in 1864 they made six per cent. for a hundred years on a sum which would make \$1,400. They have seven sets of cards there. Suppose they throw off one set of cards and move it down, as they did from Belvidere No. 2 to Belvidere No. 1, and they lost one-seventh of the water-power by just moving off one set of cards, and also the production of one set of cards; and you, gentlemen, know what that means. Do you think that is worth \$45,000? Can you make a profit on one set of cards of the interest on \$45,000? I should be glad to see it done, because that patent would be useful and valuable, and useful and valuable as a patent on account of its novelty.

Now, take the Snyder mill. They have seven sets of cards and they use steam-power, and it is insisted that the difference in the Snyder mill will be \$60,000 in cash value. I undertake to say that the whole Snyder mill, — and they have put in no evidence upon this point at all; you have been to see it, — I undertake to say that the whole Snyder mill will not sell, that all the power they have will not sell for \$60,000 altogether in the market to-day.

Mr. Storey. It is mortgaged for \$80,000.

Mr. Butler. I said with all the power; so there is no occasion for interruption. It would not sell to-day for \$60,000. Why, you can buy all through Western Massa-

chusetts a mill for how much? For \$7,000. I appeal to your knowledge that all the appurtenances there are very much better than this. There never was so extravagant and outrageous a claim. We never shall get the resumption of specie payments with such inflation as this. There never was anything like it under heaven, — never such inflation in values.

Now, again, we will come to Mr. Simpson, and I undertake to say that it could have been bought on the first day of January, with twenty sets of cards, with all its privileges and appurtenances, and in as good order as it is running, for half a million dollars, — the whole thing, village and all, dwelling-houses included, so far as that is concerned. We know something about the value of property. In 1857 the Middlesex mills sold for \$300,000 only, at public sale.

In regard to the Talbot mill, I am more in doubt, for this reason: Treating the matter now in this general way, I don't know how much water he has got. If I take these tables, then, he has got 400 cubic feet per second, and they seem to be worked out with an accuracy and conclusiveness which are very convincing. I should be like a Dutch justice, and if I didn't hear the other side I should certainly think that was right. Well, if we take one-fifth of that, we have a great deal; but if I take all that I have down at the Wamesit dam there cannot be but 220 feet relied upon in that river at all. then it is another question. With all that is wasted and all that runs through, with the Talbot privilege, and with the Faulkner privilege, with all that comes down in the day and night, all that can be relied on is 220 feet, and that water is of such a character when it gets down to the Middlesex mills that we don't use but 168 feet, and then there isn't but from 45 to 50 horse-power used by anybody else, which is in proof here, and, as Mr. Frizell tells us, at the other end of the dam, why that is, — water, which we consider, as it runs down hill evidently diminishes in quantity; therefore, I will leave out the Talbot dam for the present. Therefore I say you are to bring your minds to this proposition, and this proposition alone: what would be the fair selling difference in the market between that property, under the same circumstances, with the water in or the water out? Now, let me illustrate that in another way, Take the Essex dam at Lawrence, where about two per cent. is claimed to be lost, and where it is shown that only one per cent. is lost of their water, and with the testimony of Mr. Mills, that by no appreciable way known to science they can measure it to find out whether they have lost it or not; - they know theoretically that they have, but by no means known to science can they

measure it; -now, how much would that fact detract from the value of the Essex Company's property in the market? And yet they come here and ask for \$150,000, and I don't know but for more. Think of it for a moment. Would it alter the value of their stock in the market and take one dollar away from it in the mind of any sensible man to take away an amount of water so inappreciable that they cannot measure it practically? That forty times more runs away at night that they cannot even store in the best form they can put it, — that lost, and that to change by the hundreds of thousands the value of the Essex Company's property! Isn't it preposterous? Taking the market value, - and the remarkable thing is that we have now been weeks, weary weeks, trying this case, and they have not taken the precaution to introduce a single witness upon the main question of what is the market value now, and what it was then. The burden was on them. I didn't find any occasion to do it. They have given your many illustrations by which you may guess what the price would be, but where is the manufacturer that they have called on the stand before you, or any other business man that would have said, "Sir, that is the value; that is the difference"?

Now, assuming one fifty-seventh of that water-power to be gone, what percentage of deduction have they given you as the market value? They have given you no light on that at all. I should have liked to have seen any business man under heaven struggle with that question in the case of the Essex Company. Suppose we take Mr. J. Wiley Edmands, as a gentleman of great capacity, and set Mr. Edmands down here and say, "Mr. Edmands, assume that one fiftyseventh part of the water-power of the Essex Company is taken away; assume that that is so small a quantity that they are not able to tell when it is gone by any known method of measurement; assume that they have been almost thirty years attempting to sell their water-power, and have not sold quite half yet, - what difference do you think the fact that one fifty-seventh part of their water, under those circumstances, would make?" He cannot tell, and I should like to see him or anybody else struggle with it, and that is the question which you are to struggle with. I look upon it, as I think I stated before, like a man who has a load of hay; it is measured on a hay-scale that will not turn within four pounds, and his neighbor's horse as he goes by snatches a couple of pounds off, what diminution in the market value has that load of hay experienced? It is not that the hay is not valuable, but it is that is not valuable sub modo. And now I have made these observations because I think that is true, and I am as anxious as my brother Richardson can be, or anybody else, that you should come to such a determination that I can advise my clients to allow your judgments to stand in law as well as in fact.

I desire now to call your attention to some matters in regard to these measurements. The first question to determine is, what is the loss, what do the city take? and there we have a very wide departure. We insist that we don't take more than one-tenth. We don't claim, however, that our measurements for a period of three years ought to determine, or would be a determining fact of how much we take. What we do claim is, — and I ask your attention whether it is not a proper claim to make, — that our measurement shows what the rate of supply is of the Sudbury to the Concord in a dry season, and that it is the best test for that, — not showing that so many gallons or cubic feet run this year shows that this is a fair average of the year comparing it with the rainfall; but to show, other things being equal, that there is no more reason why the ratio of water that comes down should not be the same, for a series of years, as that which comes down this year. We measure the amount of water which the Sudbury and the Concord send down, and we find how much the Concord sends down, at the Massic dam, and we say so much went in, so much is found here. two this season, by a series of measurements, bear a relation to each other; has there been anything shown why those two amounts, or like amounts, whatever amount is in the Sudbury, and whatever amount is in the Concord, should not bear the same ratio to each other in a series of years and forever? Not that there will always be every year the same amount in the Sudbury, or the same amount in the Concord; but, as it is shown, of the water of the Sudbury which would go into the Concord, there would be one-tenth only accounted for at the Massic dam; that is, it would be only one-tenth of what was accounted for at the Massic dam. there any testimony here, or is there anything in the science of engineering, or is there anything anywhere that would tend to show that the same ratio in amounts would not attain every year? They admit that the dryer it is the more certain it is that the water will come down, because it will not be lost in flowing over the marshes and meadows; therefore, in this dry year, they will get all of the water of the Sudbury river that they ever will get. Now, if there is not some extraordinary flood, or some extraordinary case of water running to waste, why then you get what? You get the fair amount which the Sudbury does supply at one time to the Concord; and without any great controlling incident is there any reason to suppose that that same ratio will not

hold good in the future? If there is, I do not know it, and I have given it some thought; and that, I think, is the value of that measurement; by no means determining that next vear there will not be any more water or less water, according to the water-shed running in the two rivers, but there will be the same relative amounts running in the two rivers; that the Sudbury will give the same relative supply year by year; and that the Concord will have the same relative supply. That is to say, if it now turns out, as we think it does, that the Sudbury in a low state of water only gives one-tenth to the Concord, and next year there is twice as much in the Concord, why then we say that the Sudbury will only give one-tenth next year; and is there any reason to show why that will not hold good? They claim that the water-shed will hold good always in giving a relation. So it will with certain considerations out, and so it is good year for year. We are showing the amount that gets into the river bears the same ratio to the amount delivered year by year; and if it does, then I say we have demonstrated by the best possible evidence that taking the Sudbury only takes about one-tenth, and without going into averages, which my brother Child well explained are not to be relied upon, because of the great unreliability in times of freshets of water running to waste, so that the mills by no means use the average of the rainfall, — not more than three-fifths, I think I made it by my calculation. Certainly quite one-half of the rainfall in our streams is not utilized by the mills. I think I am not wrong in that; I wish your attention to it. What I mean to say is, that the rainfall on the water-shed, the dam at Lowell, on the Merrimack, would not hold more than so as to utilize one-half of it, and the dam at Wamesit would be the same; so that I shall proceed upon the ground that there is proved affirmatively not more than one-tenth. Well, now, then comes the question what is that tenth? In the case of Mr. Simpson it is of no consequence, because there we have the exact measure; we have to compare it with nothing, and I need not trouble you with any further remarks on that; you have got that before you; there is no question of comparison; you know exactly how much water we have taken for the last three years from Mr. Simpson, and you know exactly how much it has cost him for coal; and I don't see that this latter testimony has altered the case of Mr. Simpson at all from what it was when we submitted it; and I didn't understand any new suggestions from the testimony on the part of Brother Hodges, except that we show you exactly how much water we took. We always did that, and were always prepared to do that; there never

was any difficulty about that; that is, there has been so much water taken during those years. I only object to my brother Hodges' idea that forty-five inches of rain is six inches less than the average. I don't understand that.

Mr. Hodges. It is so by the tables.

Mr. Butler. Is it?

Mr. Hodges. Yes, sir; I take your tables.

Mr. Butler. I don't know that the tables show that; and if they do show it, they are not tables that I have any reliance upon, because I had supposed that nothing was better settled than one thing, that the limit was from 46 to 48,— the lowest 46 inches and the highest 48 inches in the year, — and 45 is not the mean of that unless my arithmetic is entirely at fault. And unfortunately for all these calculations it is admitted now that the average rainfall in the dry months in these three years, when we have been measuring, are exceptionally large; that is, greater than the average for a series of years. I called Brother Abbott's attention to that when he was arguing.

Now having established, I think, by the very best evidence, that the ratio of supply of the Sudbury river that can be utilized is about one-tenth, the next question is, what is the flow? Leaving Mr. Simpson, who has a right to it all, the next question is, what is the flow of the Concord at Billerica dam? Because then we have got a deduction of one-tenth of the water power there in the cases of Mr. Talbot and of Mr. Faulkner, and then I believe it is beyond all question that the same amount ought to be found at the Wamesit dam. Now, Mr. Abbott has summed up — what he says is in the testimony, page 536 q. After making his calculation: —

"Talbot's right whe requires, . Amount actually furn				. 4	105. cu. ft. p. sec.
Deficiency				. :	170.71
July, at 20 per cent.	:				
Talbot's wheels re	quire				
Faulkner's .	•				57.3
					477.8
Amount actually supplied after deduct-					
					0.05
ing 72.3 miles	•	•	•	•	265.
Deficiency					212.8

Deficiency 140."

Then he goes on with those calculations at all times. In other words, he assumes that the power at the Talbot dam was equivalent to a permanent power of 405 cubic feet per second, because he says that Mr. Talbot has not ever been shut down for a series of 25 years except on one or two occasions, and Mr. Talbot says that until they get below the top of the bolt, or the water is actually in danger of getting below, that they draw all their wheels, dyewood wheels and others; and, in the division between Talbot and Faulkner, Talbot was given, according to that deposition, 405 cubic feet per second, which the mills required. He draws above the bolt, my friend.

Mr. Shattuck. But when he says it comes down to the

bolt he don't say there was 405 cubic feet running.

Mr. Butler. Pardon me; the evidence is before you; here is the table. When it is not down to the bolt we do not injure him at all, when it is running over the dam, and the dam is as high as the bolt except three-quarters of an inch, and Mr. Abbott's table says this, and I examined it, and I asked Mr. Abbott to-day if he stood upon it; and he said he did, and there we have it proved to a demonstration. Nay, he is taking deeds on the ground there is a permanent power of 405 cubic feet per second there; he cannot drive his machinery without it; he built wheels, valuable turbine wheels, and put them in to use it, and he says he does use it. That is the testimony, and if there is anything proved on earth by human testimony in regard to water-power, there is that there is 405 cubic feet as a permanent power at Talbot's, and if the testimony stood alone, gentlemen, I should expect you to give a judgment upon that. I should myself, but there were the old wheels in the old time. Then the Faulkners, living on that water-power, born on that water-power, and knowing all about it, go into a division with the Talbots, when the water is above the dam, upon that thesis, and make it 405 cubic feet of water. Well, I suppose that that testimony will bear strongly on your minds. If it is not true, then it turns out that you can prove anything about water that you want to; it depends where you strike in. It appears that when you want to prove there is no more than 220 cubic feet, you can; and when you want to prove there is double that quantity, you can

by equally good testimony of engineers and mill-rights, and gates and water-sheds and every sort of a thing. Now Mr. Abbott has calculated a water-shed here which gives him an amount of water regularly every year; he says he has gone back for nineteen years and he finds that his water-shed, when they add the Sudbury in, upon any calculation of water-shed, whether the New York rule or the Mississippi-river rule or any other rule, taken at 25 per cent., gives him that amount; and he comes here and convinces you of that; the water-shed gives it, the gates take it, the wheels require it, the measurements give it. Good heavens, how they pile up the testimony here that there is 405 cubic feet of water a second! and if you don't believe that, you will get so that you will not believe anything. There is Mr. Simpson pouring right down into this river about 60 effective horse-power night and day all the time, and besides the immense amount of steam condensation which goes into the river. They start off with a pretty large amount, away up at the top. If there is anything proved in this case, and I am anxious about my friend Talbot, quite anxious about him; I don't want his case disturbed by Mr. Frizell and his measurements, or by Mr. Herschel; I have a personal interest in his case; I don't want to have my water-power down at Wamesit abused; it would frighten off my tenants if there is only 220 feet of water; therefore I hope not, therefore I stand by Mr. Talbot's measurement strongly. There are two or three things against them. You will find, by looking into the commissioners' report, when they measured that they got the actual flow of the river only 200 feet a second; but they were measuring to show that there was not enough water in the river to flow the meadows over; that was what they were after at that time, and they demonstrated it completely.

We now come to what is proved at the Wamesit dam. Well, here has been an exceptionally dry year, and it is proved at the Massic dam that there is a minimum of about 180 feet. Well, that don't militate at all against the quantity

of water -

Mr. Shattuck. That is not exactly the statement; that is, it is proved to be 180 feet in an exceptionally dry year. Mr. Frizell's testimony is that it was 225 feet.

Mr. Butler. I say, in an exceptionally dry year it was

180 feet.

Mr. Shattuck. I think you misunderstand Mr. Frizell. He said, as an expert, taking into account the water-shed and the rainfall, and his measurements, he should say 220 feet was about all a prudent mill-owner could rely on.

Mr. Butler. I understand it.

Mr. Storey. I will call your attention to the testimony: -

" Q. That is, the 225 feet per second was the available effective flow before the diversion of the Sudbury?

"A. Yes."

Mr. Butler. I am content, and think he said at another time 220.

Mr. CHILD. Two hundred and ten.

Mr. Butler. I was only saying he finds that minimum of 180 feet by measurement; but how much was held back he didn't testify. It is in testimony that only a part of the Wamesit mills were running and in an exceptionally dry year; and then he says, calculating from the same watersheds, from the same testimony, with six miles more of it, you cannot rely upon 225 feet; with six or twelve miles more water-shed you cannot rely upon 225 cubic feet; that is, no prudent mill-owner will rely on it. Well, now here are Mr. Talbot and Mr. Faulkner, very prudent and reliable millowners, they are relying to put in wheels, putting in machinery, putting up mills, expending \$700,000 or \$800,000 on the strength that they have got 405 cubic feet per second; and so certain are they that they spend \$800,000, and Mr. Talbot, who has got the first right to that permanent waterpower, risks his whole capital upon it, and don't even put in a steam-engine to help it out when it is dry. It is not only an average permanent power, but a power at all times, and he never stopped but twice — threw off a little machinery in the afternoon — in twenty-five years; drawing upon that draught all his works. Sometimes he would have only his woollen mill on, but the moment the water was above the top of the bolt, then he put on his other wheels; which take, too, and more than, all that amount of water; so that there is a couple of prudent mill-owners depending upon more than that. But I don't stop there. There was another Mr. Faulkner, the old gentleman who owns the Faulkner privilege down on Wamesit dam. That Mr. Faulkner was born on that mill-dam almost, lived on it all his life; by a change of family circumstances, his brother bought out his share of the manufacturing; he was a manufacturer; he had watched that water run from the time he was a boy up to the time when he was a man. A few years ago only, when he was in the full maturity of his power, he goes down on to Whipple's dam, only six miles below, and he buys water-power, upon the ground that there is 288 cubic feet per second, and puts up a mill on the strength of that opinion, and agrees to take only an aliquot part when there is any less, and he runs

his mill from 1862 up to 1875 without stopping a single whole day upon that assumption. Am I not right in that evidence?

Well, about that time Mr. Mather, he bought, and Mr. Stott higher up, it was so valuable; Mr. Chase, of the Snyder mill; the American Bolt Company; all these men, knowing the state of that river, prudent mill-owners, all took it on the basis of about 288 cubic feet per second, and they took it that it would furnish all the time 288 cubic feet per second; for they made no provision that Mr. Whipple should not draw of the rest just as much as the canal would carry through the whole night. They thought it would give 288 cubic feet per second, night and day, because, I say, they made no provision that he should not draw through the night, and that was to be with only a flowage up to the height of the permanent stone dam, with a covenant that flash-boards should be kept up eight inches, in order to keep up the head. Well, now what shall we believe? I will tell you what I think about it upon this testimony. I don't believe there is quite as much as Mr. Talbot did; I think there is very considerable more than Mr. Frizell did. I think that that power is reliable for about 288 cubic feet per second all the time, except about thirty days in the year, and for nine months in the year it is reliable for 500 cubic feet per second, and more, too; and, if you will look over the testimony, you will see that it is used that way to-day, and people build mills. The Bleachery Company, - they bought at the tail end upon the strength of that. Well, now do you suppose these gentlemen didn't all examine it? and I would rather have one man's act, when he is doing his own business for himself, than to have all his opinions when he is called as a witness that he can possibly give, because in the one case he acts upon what he knows, and in the other case he testifies upon theory. Therefore, I think that you will come to the conclusion that there are 288 cubic feet per second, or about that, all the time, and that there is about one-tenth of that taken, and that these gentlemen are only injured when it is drawn below that; and that is the proposition which I hope to maintain before you upon that branch of the case. The reason why I say so is, that all these men have gone into a purchase upon that ground; second, that the Wamesit Power Company let 246 horse-power of water guaranteeing 204 of it upon the ground that there will be a surplus of 288 cubic feet per second for so much of the time that they can afford to supplement by steam, and let at \$75 a horse-power. Now, Mr. Faulkner, on the Wamesit dam, tells you that he never had stopped his mill, except a

part of some day, for want of water; he has always run to his full capacity, and for a little more, and once we had to have a lawsuit to fetch his wheels down to what he ought to take. He is one of the gentlemen who takes more than he ought to. Now, the Chase mills don't show you that they ever stopped over one day for loss of water. There is Mr. Snyder; I tried to get something out of him, and could not; they took care not to bring anybody who does know. He is only a hundred feet lower down than Faulkner; and,

if Faulkner runs all the time, why cannot Snyder?

Pardon me, then we come to the Stirling mill. Nobody ever said they were stopped for want of water. Then comes the American Bolt Company; nobody ever said they were stopped for want of water. Then comes the Stott mill, Belvidere No. 2, at the Lawrence-street bridge; and nobody said there that they were ever stopped an hour for want of water, and they never had any steam-engine to help them out in that mill until the taking of the water by the city, and they never have started that steam-engine; and, while that is going on, and at the same time, the Wamesit Power Company are guaranteeing 204 horse-power, or 68 cubic feet of water only, which belongs to them, and the surplus; they have not run altogether more than sixty or seventy days in the year. Now, I don't care about any measurements of the canal; I don't care about anybody putting a chip in and saying how far down it goes; they are the effects of the water running through the wheels. Why, they say Mr. Wood and the Bleachery don't get their fair share. I agree to that, that they don't; because why? We are using nearly double that amount at the Wamesit Power Company, double our amount, 268, because I insist there is more than 288 feet running there, and it turns out that the more the head is drawn down, the more water runs through the canal, and therefore the measurements of Mr. Tilton show you — what? Why, show you what we are doing when we are drawing all that number of horse-power, 600 horsepower, -over 600 horse-power, -as the 288 feet upon the calculations they make, and then we have 200 horse-power more daily. Isn't that the condition of things there? And they say it is a very permanent stream. We all agree to that, and therefore I am trying to convince you, because I think there is a fair point to be taken, that it is a permanent power with the exception of some thirty days in the year, when all power on small streams fails, and the smaller the streams the surer they are to fail. That is a permanent power; it may be relied on, and for the rest of the year it may be relied upon for twice or thrice that amount. That is a fair condi-

tion of things, and from that you are to deduct how much the Sudbury river fairly adds to that, and how much that would disturb the market value of anybody's property. And now allow me right here. You have heard of the most expensive steam-engine, you have heard of the most expensive firemen, with the greatest amount of fixtures, the amount the city was going to pay for them; reckon steam-engines by a thousand, what was done, boilers, boiler-rooms, and how much more you would have to get? When Mr. Faulkner gets a steam-engine to eke out his works after the city has taken water, and after the Wamesit Power Company have taken all they can get, it costs him for his engine \$400, and he hitches it on to the steam boiler that he has to do his dyeing and heating with, and it runs along, and the only danger is, it makes it a little warm in the room where it is, and eight months out of the year he has to heat that room, so it is all the better.

[$Adjourned\ till\ half-past\ one\ o'clock.$]

AFTERNOON SESSION.

At the reassembling of the commissioners General Butler

resumed his argument as follows: —

May it please your Honors: If I am right that there is 288 cubic feet of water to be depended upon in the power, then the question is: What do these gentlemen lose upon the dam when it is below? They lose one-tenth of their power. What is the market value of that? Take Mr. Faulkner, for instance. He gave \$5,000 for his land and 25 cubic feet of water. Mr. Mather gave \$15,000 for his land and 36 cubic feet of water. The interest of that would make it about \$20 a horse-power. During all this time the market price of water-power at Lawrence was \$20 a horse-power. It seems that a horse-power at Lowell, at the Wamesit dam, was sold at about the same price, and that price has remained unchanged in Lawrence from that day to this. There is no doubt of it.

Now, was not Brother Child right when he called your Honors' attention to the fact that we were not to pay for supply of steam-power? It is not necessary to supply steam-power. All they have got to do is to throw off some of the machinery. How much less would that be? But if their claim is a true one, — that there is only 220 cubic feet to be relied upon, and that the canal will not carry any more, — why, then their rights are to be restricted to that; — for they

bought, - not working horse-power, - but they bought oneeighth, one-twelfth, one-sixteenth, as the case may be, of the water-power in that river. Don't talk about the water-power in the canal. It is the water-power in the river, when the water was at the height of the permanent stone dam, and every other drop of water, during every night and Sunday, belonged especially to Mr. Whipple. He expressly reserved that, meaning that he should never exceed such an aliquot part of the water, - of 288 feet, - however much or however little he has running in the river. So that their part was of very little value, if there was only 220 cubic feet of water in the river, — because they have only their aliquot part of 220, not of 288. But I repudiate that theory. I insist that there was a fair average power of 288 feet. Good, clear-headed, sound-minded business men have erected large numbers of mills and have gone on with their business upon that basis, and I think that it is an accurate one. I don't know that I can aid you by any other suggestions upon this matter. The evidence is wofully short on the part of the complainants. They will not tell you what their mills are worth, what the market value was, what the market value ever has been. They have not given you a scintilla of evidence upon that. And I think the best illustration of the poverty of their evidence is that old Mr. Charles A. Stott, who had the Sterling mills, has not been brought here. They brought John Stott here for what he did not know, and not for what he did. But Charles Stott is a clear-headed and stupidly honest old Englishman, and if you got him here he would tell you just exactly what it was, let it come back or edge, no matter what happened.

Mr. Shattuck. Do you say this upon the evidence?

Mr. Butler. Yes, sir; I say this upon the evidence, because, if he would have aided them at all, he is the man who is best informed. He is the man who built Belvidere No. 2, has always owned Belvidere No. 1, and no man knows more about it upon the face of the earth. That is the evidence. He is of age, and not too old. Why don't they bring him? Why don't we have some testimony of what this property is worth? Why, I would have agreed, for the amount that is claimed here, to have purchased the whole of this property from Simpson to the sea, — always excepting the Lawrence and Essex Company, which is not injured at all. I do not, I say, think I can aid you upon this any more. I do not think the calculations are very valuable, except as showing how far statistics will mislead, — and there is nothing like statistics to mislead either. But the action of men is the best test of an actual state of facts.

Now we come to the case of Mrs. Richmond; — and I think that is the most illustrative case of inflation of damages. Let us take her case fairly. She has 288 cubic feet of water running over her dam, if there is nothing over Wamesit dam or River-meadow brook. It has been running there since creation, and she has not utilized but little more than half of it. Now what does she come in and say? Why, "I must have large damages." Why? "Because this waterpower is very valuable." "Lowell has grown so as to show the value of water-power." Now let us take one fact: She has two wheels, — one of fifteen and one of fifty horse-power - the rated amount, more than twenty years ago, by those who owned the power before her, and by her husband, using in the same way. It is admitted that they are so set, when not having a sufficient rent for the water, that they lose, and get not more than 45 or 50 per cent. of the horse-power that the wheels are capable of if they were properly set. Is not that the testimony? That is the testimony of her own witness. And he swears that for about twelve hundred dollars all that might be remedied and get the fair weight of the wheels and seventy-five per cent. of the horse-power. Very well, then, rather than to re-set those wheels, at an expense of \$1.200, for twenty years they have been running at a loss. The original owners set their wheels so improvidently that they would not deliver the water; so there was a loss of 45 to 50 per cent. on the 65 horse-power. Now upon any calculation that loss was equal to the loss by taking the Sudbury river. And rather than pay \$1,200, they have run under that loss for twenty years. Is not that so? Am I wrong? If I am wrong you will correct me. And I want to say, in all fairness and honesty, that I want you to let Mrs. Richmond have as much as you can consistently with truth and facts. There is no more deserving woman on earth. She is my nearest neighbor almost; and I would rather give her five dollars than take one away from her. But these claims are perfectly preposterous — perfectly preposterous. Let us try it in another way.

Mr. Shattuck. 1 differ from you, General. I do not think we are to be punished on account of what others have

done.

Mr. Butler. The only difference between you and me, Mr. Shattuck, is that you ought to be punished a little for inflating your values so much.

Mr. Shattuck. You began by crediting her with a little more inflation than you did us. You said it was one of the

best illustrations of the inflation of damages.

Mr. Butler. I have dealt with that for the purpose of

showing what the action of men was. And here is her husband, — here are those that owned it before her, — they have thought that the loss was of so little account to them

that they would not pay \$1,200 to save this power.

But let us take her case in another point of view, which is pretty material, I think. She says that she lets to Mr. Coffin and to Mr. Walker all her power. She gets \$5,800 rental. The testimony on her part is, that she has about \$75,000 of mill property and machinery, besides her land there, which is included in that lease. Be it so. It is about \$75,000. That is independent of the land and the waterpower and the 100 horse-power, which is about what she claims she has got there and lets. Then she lets \$75,000 worth of machinery and buildings for \$5,800, and pays taxes and repairs. How much does she get for her water-power at any per cent. that you can reckon? How much does she get for water-power upon any possible percentage that she can reckon? How much a horse-power, given 60 per cent. of the \$75,000, — how much would the hundred horse-power let for? There is the value of a horse-power right there in Lowell, with buildings and machinery worth \$75,000, — and I suppose nobody thinks of letting buildings short of eight per cent. (they ought not to), and paper machinery short of eight per cent. How much is left for water-power? Judge Judge ye. She is damaged somewhat, I agree. am upon the question of the after inflation of all this. gentlemen that ask you these enormous sums can go and hire forty or forty-five thousand dollars' worth of buildings (for Mr. Walker is only on a lease at will) and thirty horsepower for \$2,800 a year! It is let day by day at a lease at will, at that, at this hour. Well, is it not wonderful that the claims are made in this way? Is it not wonderful? Let us get out of the region of fancy and fanciful theories and fanciful calculations, and come down to the business of life, taking the money which will be a remuneration.

Then there is the Belvidere No. 1, a title which I have utterly failed to understand; but I hope you will be able to show exactly what the rights are. You know precisely what an old-fashioned fulling-mill right was worth. You know precisely what an old-fashioned saw-mill right was worth. And you will find out what Abner Hill's was worth, and then you will deduct it from the surplus power that runs over the dam. Well, my proposition is, that such a water-power only is not worth much of anything. The Wamesit power is treated so, while not building mills to remain idle. It is not worth much of anything. It is a surplus power to be used at such times as it may be used, but yet it is

valuable as an adjunct to the steam-engine. Parker, Wilder & Company have demonstrated their belief about a steam-engine. They prefer to use their Mill No. 1 to be run on surplus power, — which required a steam-engine to run it most of the summer, — rather than to use their Mill No. 2, which always has had water enough, and never had a steam-engine which they used. And for two years they have let Mill No. 2 stand idle, and moved its machinery into Mill No. 1.

Mr. Shattuck. You are not right about that.

Mr. Butler. Yes, sir. I will give up my case if I am not right. They moved down their cards from Mill No. 2 to Mill No. 1. Didn't John Stott so testify? If I am all wrong about this it is of no use for me to argue it before intelligent gentlemen. For two years they have let No. 2 (running by power, where they had never started by steam) remain idle, on the same work, removing the set of cards from it to No. 1, where they have run by surplus power and steam-engine; and John Stott testifies that it costs about as much to start up a steam-engine as to run it for a day. Well, that is the condition of things, is it not?—the same work, because the same machinery is moved. Both parties own the saw-mill. Which do they stop, No. 1 or No. 2? They stop No. 2, and move part of the machinery into No. 1. Now, gentlemen, you can judge of these things as well as I; and having indicated the facts I pass from those two mills.

In the case of the Bleachery, what are they damaged? What is the practical damage, while there is a possibility of user on their part? But they bought this power and put in the wheel, when the city had not water, for the purpose of using the force-pump in time of fire. In the working days of the week they had the pumps attached to their steamengine, and therefore had not any occasion for this. But as to nights and Sundays, they had no way of starting up their pumps unless they started up their steam-power. They bought this water for a small sum, and they have never used it, except its proportion for washing purposes, and never have made any complaint, upon any evidence here, when they have been deprived of it. Why? Because nights and Sundays the canal is always full.

And there is Mr. Wood. He has always found it convenient not to complain, and run his mill nights and Sundays, whenever there was not any water, allowing the power to accumulate, to use the water at other times. Why? We find that early, he having a wheel, and having a right to 20 horse-power, he put in a 40 horse-power wheel,

and got sued for it, and had to take it out and put in another; and he came to the conclusion that it was best to behave pretty well, and get along pretty easy. He has a right to so much water, I agree, as is the value for his gristmill. He runs it nights as well as day-times. He has always power to run at night. If he has not the water, and the water practically is of no use to him, I don't want to say anything more about it. It is a small matter, in any event.

So far as those dams are concerned, gentlemen, I don't see how I can aid you any farther. These considerations are the considerations that move me, and I put them before you. If you are to be moved by all manner of fanciful calculations, I can't help it; but that will not be giving the rule of damages, which is the market value. How much do you think Mr. Faulkner's mill, with its 400 horse-power engine to make up the power, would be worth, more or less?

Now, gentlemen, I come to another proposition, which I don't think was fully presented. I pass the matter of damages. I come to another consideration, bearing upon the rights of the parties here, which I don't think has fully found lodgment in your minds, because my brother Child used the word "compensation" in discussing it. Mr. Whipple, the grantee of all, - all of whose rights are now deeded to the Wamesit Power Company by deed, which will appear in the printed record, - granted for certain hours of certain days a certain amount of water to be taken out of his millpond (raised by his dam) by means of a canal. He reserved all other water to himself,—reserving 68 feet out of 288 feet, which is quite one-quarter of all the water. One-fifth would be enough in any calculation for our purposes. Now, then, what does Mr. Whipple do? What would he have a right to do? Would not he have a right to take the water out of the river whenever he chose, as against his grantee? Is he bound to let that water run into that canal? Could not he build a canal on the other side of the river, deduct the dam, and open a hole just to let in 68 feet a second, and use it there? I think he could. Is there any doubt upon that law? Is there any question about it? Pardon me, can there be a possibility of doubt upon that? Very well. Now, Mr. Whipple has sold to the City of Boston, and they choose to take their 68 feet of water out of the Sudbury. Is there any objection that you know of in law to their taking it out up there? They stand here, — and they have bought the right to take all the rest of the water, too, after taking it out. They have settled as agreed with the owner of the Wamesit dam, the owner of all the resultants, all the

excess, and all the surplus. Now, the city chose to take theirs out of Sudbury river, and leave all the rest of the water except 68 feet in the river. Have they not a right to? Would not the Wamesit Power Company have a right to? What is the answer? Would not the Wamesit Power Company have a right to take out up to Billerica, if they chose, if they owned the land up there, or on the other end of the dam where it was once proposed to run a canal, or anywhere else? The deed says—

Mr. Shattuck. Let me suggest that you have not put in the whole transaction. If you put in the whole transaction, I will not object to the deed. If you turn to the record, the statement is that the gentleman read an answer.

Mr. Butler. I did not ask you not to object. The fact is proved. It is here now. Now, then, we stand here: We have proved from the Wamesit Power Company; we have put in a deed of 68 cubic feet, more than one-fifth of the water, and the city has taken that out at the Sudbury.

Commissioner Russell. I am not aware that that deed is proved. It was offered, as I think the record will show, as proof that the City of Boston was joint owner with the petitioners of the water at the Wamesit dam; and, being offered solely for that purpose, it was ruled out, on the ground that it was immaterial whether the city was a joint owner with the petitioners, or whether the Wamesit Power Company was joint owner with the petitioners. The ground now taken was never assigned as a reason for admitting that deed. It was then offered to show that the City of Boston, having acquired that title, proposed to put in proof to several petitioners a deed of a portion of the water-power, which should be a compensation for the amount taken, and no ruling was made upon that offer, because it was stated that those deeds would be prepared and tendered at the next adjournment, and that is the last that I have known of the matter.

Mr. Shattuck. The last word that was said upon the subject was, "I can only rule upon that which is offered in evidence, and I rule that this deed is inadmissible." It is on page 185 of the testimony.

Mr. Butler. Very well. The deed is before you. If you say you cannot hear it, I cannot help it. Here is the fact I offered to prove. If you rule it out for a wrong reason, I cannot help it.

Commissioner Russell. It was not offered in proof of the fact which you now offer it upon, so far as I now

remember.

Mr. Butler. Pardon me, Mr. Child argued the power

and the right to ask compensation. I propose now to offer the deed and see. This is what I offer. I don't want to do anything but this. I offer the deed now.

Mr. Storey. I object to it, on the ground that the case

has been closed.

Commissioner Russell. On what ground do you offer it

at this stage?

Mr. Butler. Because up to this hour I supposed it was in. I supposed it was in to show compensation by giving a deed. I offered to assure them of the conveying of this amount of water by deed.

Mr. Shattuck. The deed never has been produced.

Mr. Butler. It has been produced, and is in print, I think.

Commissioner Russell. The deed to these petitioners?

Mr. Butler. I came to the conclusion that it was of no consequence; that the water was ours, and that we were taking it out above. If you are going to give damages for one-quarter of the water when we own it, I cannot help it.

Commissioner Russell. If you say that you have proceeded in this case since the offer of that deed under the misapprehension and on the ground that it was already in evidence, we should open the case for the purpose of allowing you to put in the deed. It is, of course, open for the other party.

Mr. RUTLER. [Interrupting.] I have talked it over with Mr. Child two or three times upon the ground that that was the proposition. My first idea was to say, — "We will deed

the water to you."

Mr. Shattuck. I will not object to your putting it in if you will put in the whole contract with the city, — the whole arrangement, in which it says, — "In consideration of so much money and such other considerations, which other considerations appear in the vote of the City Council," etc. If they will put that all in, they may do so; but I object to ex-parte transactions.

Commissioner Russell. I should think it was open to

you to put that in, if the city puts in the deed.

Mr. Butler. I don't know whether it is or not. I am

not making any bargain at all.

Mr. Storey. I understood them to say that they would offer the deed. I supposed it would then be open to discussion. When the deed is offered I shall desire to be heard upon the point.

Commissioner Russell. Part of the deed was read, as a

part of the offer of the deed.

Mr. Butler. We can have it here in a few minutes. It

is the first time that I heard that, as against a third party, the consideration of a deed made any difference. It does sometimes in insolvency. The question is whether they own it.

Mr. Storey. The discussion upon that matter covered some two pages of the printed record; and then after that General Butler said, "There is one thing further;" and then he proceeded with a long argument.

Commissioner Russell. Does the report show the offer of the other deeds and the suspending of this until they

were put in?

Mr. Shattuck. There was an offer to produce the other

deeds at the adjournment; but they were not put in.

Mr. Storey. [After reading a portion of the discussion on this matter from the printed record.] Thereupon the title was ruled out, and we supposed there was an end of it. Now why, after that, there should have been any misapprehension, I am at a loss to see.

Mr. Butler. The question is whether the commissioners can see it. I have a copy of the deed here. I have not the original deed, because it happens to be locked up, and the man has gone away with the key. Here is a true copy of the deed. I offer this copy. Do you want me to produce the original?

Mr. Storey. We don't care anything about the form.
Mr. Butler. This is the copy. I offer it. It commences as follows—

Mr. Storey. What is it offered for?

Mr. Butler. It is offered to show, among other things, that the City of Boston is the owner at the Wamesit dam, and in the Concord river, of more water than the amount taken by them from Sudbury river, by the taking of Sudbury river, and that they have taken that water from the river, as they have a right to do.

Mr. Shattuck. When you offer that I ask you one question: Is not that water conveyed to the city with the distinct agreement that, if it cannot be put into our flumes, it

shall be quitclaimed to you?

Mr. Butler. I have not been sworn, and have not been paid my witness fees. If there is any such thing you will show it. I am going to read this deed, if you will allow me.

Mr. Shattuck. I object to your reading it.

Mr. Butler. Now, I will answer that question. I don't understand that to be the effect of it. But it is all there on the record, and if you will look you can see it in any form. The proposition, Mr. Shattuck, — let us come right to the

meat of this thing, — why, the city pays for the very purpose of putting themselves in possession of this water to meet your case. And there is, I suppose, somewhere an agreement that, if it is not used to meet your claim, it may go back. But if it is used to meet your claim, it is there forever. It is not to put in your flumes; I never heard about that. If it was not used in settlement, it was in some form. The understanding was that it should go back if it was used in settlement. Then it is gone forever, and we take our money instead. That is the effect of it. I have not seen the paper for a year and a half.

Mr. Storey. This deed is dated the first of December, 1875, and our petition was filed the 14th of June previous. I don't understand that any transaction occurring subsequently can possibly be of any importance in this case.

Mr. Butler. Now, the first thing that we try is, shall

I read the deed?

Mr. Storey. The first question is, whether the deed is competent.

Mr. Shattuck. It is here, and a certain portion of it has

been read.

Mr. Butler. I only read the opening just for identification.

Commissioner Russell. I would like to refer to the early part of the discussion as to the offer of that deed. Mr. Storey calls to my attention that it was excluded upon the ground, among others, that the rights of parties were fixed before this deed was made, and this application was filed.

Mr. Shattuck. That was one reason that was stated. Mr. Butler. Shall the deed go in, or remain out?

Commissioner Russell. Mr. Storey objects that the deed is shown to be subsequent in date.

Mr. Butler. There is no offer of anything now. The

question is whether this deed is to go in.

Commissioner Russell. Mr. Storey objects to it now on the ground that it appears by the date of the deed that it is subsequent to the filing of that petition, and that the rights of parties could not be changed after the taking and after the petition for the recovery of damages.

Mr. Storey. As Mr. Russell has requested that I should read the early part of the discussion, I will read it now.

[Reads the discussion.]

Mr. Butler. Now, I will state the grounds on which I offer it, and on which I think it is competent, notwithstanding all that has been said. I fail to appreciate, I say with all frankness, the idea that it was not competent for us to show that the city were joint owners of this property with

the petitioners, if it is joint. If it is several, then to show that we had a community of rights.

Commissioner Russell. I take it that your title is not

that of joint tenants in any event, is it?

Mr. Butler. Joint owner. I did not say joint tenants at all. "Tenants in common" would be the legal phrase. I don't think that if the city should die it would revert to either of these parties. I am not instructed that way. The

criticism would hardly be necessary.

I was saying that we have a community of interest in any event, and we are joint owners, perhaps, in one view of the deed. The title to this water, at the date of our taking, stood in the Wamesit Power Company and in these petitioners, in certain proportions, and in certain degrees of interest. I now offer to show that a title from the Wamesit Power Company to an amount of water greater than was taken by the city, passed into the city by sale, and that therefore the petitioners are asking damages, because the city proposes to take, now and hereafter, their own water out of this river at Sudbury or Framingham at the mouth of Sudbury river - more than their own proportion. I offer the deed, among other things, for that purpose. There is no fixing of anybody's rights by the filing of the petition. I take it that the city has got a deed from the owner of all the water that they take, whether the deed is before or after. It is one of the infelicities of trying these cases without their all being joined in one. I agree that that is so, and I have taken my objection upon that. Now, I propose to show that one of the tenants in common of this water, being the paramount owner of the land and water-rights, with certain rights carved out, has sold his interest to the city in the water which the city take, and that the city, in any event, are jointly interested in these damages, whatever they may be in that view. But a still further and bottom view is that they own the water which they take, with right to take it anywhere they please on earth. They have got a right to sixty-eight cubic feet of water forever by deed, and you are called upon to give damages for their taking their own water in their own way, leaving the water that belongs to these parties in the river, to run into the canal. That is the ground on which I offer the deed.

[The commissioners confer together.]

Commissioner Russell. We are all of opinion that the deed is inadmissible, even for the changed purpose for which it is now offered.

Mr. Butler. I take it that it may be printed in the record for the purpose of showing what I did offer.

Commissioner Russell. I think that is all apparent. I

think that all you have said has been taken down.

The deed was stated to contain a certain conveyance, and to be offered for a certain purpose; and I take it that is the usual way in which a question of that kind goes up, and not by putting in the deed. It is by way of offering it.

Mr. Butler. It is for the purpose of showing what it does contain. The principal parts are in before; but I

would rather have it exactly.

Commissioner Russell. I think there is no objection to printing the whole deed, if you desire to have it printed, as a document.

Mr. Shattuck. If the City Council desire to have this printed as a part of that offer, I would like to have the vote printed.

Mr. Butler. Put it in now. I don't want to be threat-

ened with that vote any more. I want it in.

Mr. Shattuck. It is no intimidation, General.

Commissioner Russell. I stated Mr. Shattuck's offer the other day to be, that, if General Butler offered that deed, he wanted to offer the other, and not that he offered it *per se*. I don't understand Mr. Shattuck to put the other in, the deed being ruled inadmissible.

We shall have to go on without that deed and without that

title, as at present instructed.

Mr. Butler. I desire that your Honors will see that I get the full benefit of the point.

Commissioner Russell. Certainly, sir.

Mr. Butler. Because I have a strong opinion that a man does not pay for what he owns. It may be so in this case, however.

We now come to another series of considerations, and that is this: What title have these parties to this water at all? It is proved, I suppose, if anything in this case is proved, first, that the Middlesex Canal took this water under right of eminent domain, or otherwise (it is not quite certain how), and used it all up in the summer time, and in the dry time, to fill their canal between Boston and Billerica, or Billerica and the Merrimack. It is proved, if anything can be proved, that, being duly incorporated to run a canal, they had towpaths and land, which are found in their possession in Billerica, for the purpose of a canal, and for that only. It is proved that they were allowed to purchase certain mill-sites, as incidental to their canal, simply. Now, then, they diverted the water; and the presumption of law is, I take it, beyond all question, that the owners below were once paid for that diversion. Then it is shown beyond all contro-

versy, so far as I can see, that the Middlesex Canal owned that water up to 1862, with a right to divert it; and nobody could interfere with that right, by the decision of the Supreme Court; that in 1861 or '62 ('62, I think), there was a judgment of forfeiture against the canal. Now, then, what is the effect of that judgment of forfeiture? In discussing the correlative question of the Talbots, Judge Abbott insists that it allowed the property to go back — to revert to the original mill-owners, and that the Talbots, being paying proprietors, were the mill-owners. I endeavored to impress upon the minds of the commissioners, — with what success I know not,—that the right to raise a head of water by a dam higher than the old mill-dam, and using that water, was a franchise from the canal, necessary for its existence; that it could not be deeded away, if it was attempted to be deeded away, nor disposed of by the Canal Company, and that when, thereafterwards, a judgment of forfeiture, because of neglect of user or misuser of corporate duty, took place, all the franchises were, in the language of the judgment, seized to the Commonwealth. They are forfeited. Forfeited to whom? Forfeited to the men who have sold the rights? Oh, no. Forfeited to whom? Not to the canal. They are forfeited Forfeited to whom? Seized to the Comagainst them. monwealth.

Now, then, — and I had supposed that nobody had any doubt about that; and I supposed that all these rights went to the Commonwealth or to the king, and I did not therefore cite any authorities. But I come now to the great and leading case in the Second Term Reports, 515, — The King vs. Thomas Amery, and The King vs. John Monk, — where the matter was very much discussed.

In the first of these there was an information in the nature of a *quo warranto* against the defendant for exercising the office of alderman in the city of Chester. As the city did not appear, the question was, what was the effect of the judgment? and the only thing that troubled them was, whether there must not be an actual writ of forfeiture.

"Besides, Lord Holt's opinion, in 1 Show. 275, is decisive; for he expressly says that no writ of seizure is necessary. And he gives as a reason for the distinction between the writs which were mentioned by Pemberton in that case, that where there are profitable franchises to be seized, the sheriff is to take them, and account to the king in exchequer."

Profitable franchises, it will be observed, to be seized.

"But where incorporeal franchises are to be seized, which, in their nature, cannot be profitable in the king's hands, as, for example, a Court leet, there it appears, in Randall's

Entries, 540, that the leet was presently in the king's hands without any seizure at all. This is similar to the proceedings in *scire facias*; there, if the party do not appear, the thing is seized into the king's hands at once. No case has ever been adjudged against Holt's opinion; for as to the Malmsbury case being reversed, although this, amongst other things, has been assigned by the counsel for the reversal, that there did not appear to have been a writ of seizure, yet that is merely conjecture, for it does not appear for what it was reversed.

"It being now proved that a corporation, sued by their corporate name, may be dissolved by a judgment of seizure for default in not appearing, and that the words 'quosque' etc., are only form, and that no writ of seizure is necessary, it remains next to show, of which there can be very little doubt, that, if the king had a right to seize the liberties, he had a right to grant them out again to another description of persons. Even if the corporation itself—that is the ideal soul—were not dissolved by the judgment of seizure, according to what is suggested by Eyre in Smyth's case, yet all the franchises being absolutely vested thereby in the king's hands, and the separation between the natural and politic body complete, the old corporation was out of its place, and the king might substitute a new body in its room."

For that I take it (I took it before, and I find myself grounded upon that belief) in this case, that where a corporation forfeits its franchises and rights, all its franchises, and all the property which is owned necessary to carry on its franchises, are immediately forfeited to the Commonwealth, and vested in the Commonwealth.

Mr. Shattuck. Is there any authority for that in this country?

Mr. Butler. Yes, sir; plenty of them. That is only one book. Look over there, and you will see more.

It was the right to try the charter of the city. Now, I say again, and I want to make myself distinctly understood, that whenever a corporation is dissolved, its franchises, and the property necessary to carry on its franchises (that is, belonging to it, taken for that purpose) become also forfeited to the king. As, for instance, a railroad becomes forfeited to the Commonwealth — why would not the road-bed be forfeited, or would only the track be?

Mr. Shattuck. If you can find any authority for the road-bed being forfeited to the Commonwealth in this country I should like to know it.

Mr. Butler. Pardon me. I shall be able to show you

in a few moments that they cannot sell it so as to prevent the common right of the Commonwealth from attaching. When a railroad is dissolved, where does the road go to? Is there any doubt on this subject? I had supposed that there was not; I may be all wrong. The Commonwealth grants a common highway, to be carried on by certain persons. They refuse to do it. The Commonwealth brings its writ of quo warranto and forfeits the charter. Where does that highway go to — railroad or other highway? Does it go back into the hands of the men? Then, in the language of one of the books which I will show you in a few moments, it would be a premium to those men to act in such a way as to get it dissolved, because they would thus get rid of their corporate duties and have their property. It would be a premium on their not doing their duty.

I will read from the case of Erie and Northeast Railroad Co. vs. Casey, 26 Penn. State Reports, 287. I will only read at this moment, in order to answer Mr. Shattuck, part

of the head-note:—

"When a charter is constitutionally repealed, the franchises are resumed to the State, and a railroad belonging to the corporation remains, what it always was, public prop-

erty.

"The corporators in such case are not entitled to compensation, having never had any property in the road, and the exertion of the will of the legislature in the resumption of their franchises did them no injury but what they agreed to submit to."

Have I not fulfilled the bill pretty nearly, Brother Shattuck?

"An act granting corporate privileges to a body of men," says the court, Black, Justice, "is, when accepted, a contract between a State and the corporators. It is not worth while now to try whether this doctrine will stand the test of original principles. It is sustained by everything that we are bound to regard as authority, by the decisions of all the Courts in the country, by the opinion of the legal profession, and by the general acquiescence of the people. It is not denied by the defendant, or by anybody else who has attempted to sustain the action of the legislature in this case. Being a contract, it cannot be rescinded by the act of one party without the consent of the other. A grant of corporate privileges for a specified period cannot be resumed by the State within such period. If the charter be without limitation as to time, it is power forever irrepealable.

"It does not follow from this that corporations are beyond the reach of public control. When the privileges they enjoy are fraudulently abused, the Courts may pronounce them forfeited. In some cases, also, the legislature, when granting its franchises, reserves to itself the right to revoke them. When the charter contains such a stipulation, it is as much a part of the contract as anything else that is in it. The legislative repeal of such a charter bears no resemblance to the judgment of a Court against the corporation on a quo warranto. They proceed upon principles as different as the functions of the legislature are different from those of the judiciary."

Now, then, let us go a little farther:—

"The authority given by the act of October, 1855, to the defendant to take possession of the railroad, is asserted, by the plaintiff's counsel, to be an act of confiscation,—a taking of private property, for public use, without compensation."

That is, the legislature put in the defendant to run the

road

"If this be true the injunction ought to be awarded; for no legislature can do such a thing under our constitution. When a corporation is dissolved by a repeal of its charter the legislature may appoint, or authorize the governor to appoint, a person to take charge of its assets for the use of the creditors and stockholders; and this is not confiscation any more than it is confiscation to appoint an administrator to a dead man, or a committee for a lunatic. But money or goods or lands which are, or were, the private property of a defunct corporation, cannot be arbitrarily seized for the use of the State without compensation paid or provided for. This act, however, takes nothing but the road. Is that private property? Certainly not! It is a public highway solemnly devoted, by law, to the public use. When the lands were taken to build it on they were taken for public use; otherwise they could not have been taken at all. It is true the plaintiffs had a right to take tolls from all who travelled or carried freight on it, according to certain rates fixed in the charter, but that was a mere franchise; a privilege derived entirely from the charter, and it was gone when the charter was repealed. The State may grant to a corporation, or to an individual, the franchise of taking tolls on any highway, opened or to be opened, whether it be a railroad or river, canal or bridge, turnpike or common road. When the franchise ceases by its own limitation, by forfeiture or by repeal, the highway is thrown back on the hands of the State, and it becomes our duty, as the sovereign guardian of the public rights and interests, to take care of it. She may renew the franchise, give it to some other person, exercise it herself, or declare the highway open and free to

all people. If the railway itself was the private property of the stockholders, then it remains theirs, and they may use it without a charter, as other people use their own; run it on their own account; charge what tolls they please; close it or open it when they think proper; disregard every interest, except their own. The repeal of charters, on such terms, may be courted by every railroad company in the State; for it would have no effect but to emancipate them from the control of law, and convert their limited privileges into a broad, unbounded license."

And here they laid out a railroad over a canal. Now, then, if that is so, let us see where we are. In the first place let us answer Judge Abbott this morning. He admits, does he not, that that which is necessary to a corporation for the purpose of exercising its franchise and doing its public duty cannot be sold by them? Was not that his admission? "That which is necessary to exercise its public duties and its corporate functions cannot be sold." If there is anything more necessary than water to carry on a canal I don't know what it is,—and the tow-path, and everything

else incident to the canal.

Now, in the case of Commonwealth vs. Smith, which I have already put in my brief (10 Allen, 455), the duties and liabilities imposed by the charter of the railroad are stated. They cannot mortgage, they cannot do anything without legislative act, of that which is necessary for their public functions. Well, why? Because it belongs to the State. It was taken by right of eminent domain. That part of it can be taxed; every other part of it may be taxed in the towns through which it runs, under decision of Judge Shaw, referred to in my brief. It belongs to the State, and is in the State. It is not private property at all, and never was private property. A railroad corporation has no private property in its road-bed. A canal corporation has no private property in its canal and in the waters that fill it, and they cannot sell it, and they did not sell it, as Judge Abbott admits, to Mr. Talbot; but they reserved it. Very well, then, when did it ever come into the hands of Mr. Talbot? When did Mr. Talbot ever get title to it? He did not by the deed, because it was a reservation. Did he buy the forfeiture? Clearly not; because it was seized to the Commonwealth. Test it for a moment. Suppose the next hour, or in the same chapter, the Commonwealth have gone on to say, "The franchises and rights of the Middlesex Canal are hereby granted to A B, or C D, to carry on a canal forever." What would pass to them? Would not the road-bed, paid for already? Would not the head of water? Would not the

right to take tolls? Would these men have been paid twice over for water taken for the canal? No. Why not? Because it was vested in the public. It was paid for by private corporation carrying on public work; paid for by the public, and once paid for, there is the end of remuneration until by non-user they get twenty years adverse possession; and they cannot until they do get twenty years adverse possession. And all this was held in abevance until 1862, and it was taken in 1875. Therefore the Talbots own nothing here of this water. And I do not, and need not, put it upon the ground that the City of Boston has a right to take my property. I do put it upon the ground that neither of the Talbots had a right to complain. They bought nothing of this water. They bought it subject to prior use in the canal. The prior use of the canal takes it all, — that is the testimony, — and a great deal more than there is here. The prior use of the canal takes it all. Are they going to have any more — any other damages?

In the case of Coe vs. the Columbus, Piqua and Indiana Railroad Company, 10 Ohio State Reports, 375, — which is on my brief, — this language is used by the court: —

"Nor do we think the general language of the first section of the act of 1848, which confers the power to 'acquire and convey at pleasure, all such real and personal estate as may be necessary and convenient to carry into effect the objects of the incorporation,' is to be understood to authorize a railroad corporation to convey all the rights and interests in property which it may acquire. Like many other general words, they must be 'restrained into the fitness of the matter.' When power is given to acquire an interest in real estate for the single and exclusive purpose of the exercise of a franchise, and particularly where to acquire such interest there is a delegation of the power of eminent domain, the interest cannot be separated from the use to which alone it can be applied, and if the franchise cannot be conveyed, neither can the interest on real estate with which it is connected."

Now let us see how it operates upon these parties below. They are presumed to have received the money—their ancestors—for the diversion of this water. It is diverted to the Commonwealth, and once gone they have no right to reclaim it. They have no right to be paid again. And the Commonwealth may grant it as she chooses.

saith the shepherd to Touchstone. The Commonwealth may grant it to the City of Boston, and when they grant it, even by general words, it may pass. And this is the doctrine,

[&]quot;He who hath an estate may condition what he will,"

both ways, in the case of Heyward and others vs. the Mayor of New York, in 7 New York Reports, 314. This was a case where the City of New Yord had taken a piece of land for an almshouse, and were allowed to take it in fee for an almshouse by the act. They came to the conclusion not to use it for an almshouse any longer; and thereupon Mr. Charles O'Connor brought a suit for the original owner — for the quarter of the land. The question then arose what should be done with it.

"Shall the same power determine the estate or quantity of interest in the lands which shall be taken? Whether an estate for years, for life, or in fee; whether a right of reversion in any event shall be left in the owner, or whether a mere easement shall be taken without divesting the fee and general ownership of the land? It seems to me entirely clear that all these powers must of necessity rest in the legislature, in order to secure the useful exercise and enjoyment of the right in question. A case might arise where a temporary use would be all that the public interest required. Another case might require the permanent and apparently the perpetual occupation and enjoyment of the property by the public; and the right to take it must be coextensive with the necessity of the case, and the measure of compensation should of course be graduated by the nature and duration of the estate, or interest of which the owner is deprived. Where, as in this case, a fee simple absolute was deemed necessary, and was taken, all the loss and damage of the owners and others interested, by and in consequence of their relinquishing the same, was directed to be and was in fact paid. This must necessarily have included the whole value of the inheritance. There would be no justice or equity in paying the owners anything more at any time, or under any circumstances. That the use by the public of the lands in question might cease was a possibility, but was not contemplated at the time. The site of the almshouse at Bellevue was supposed to be fixed and permanent, and the annexation to it of the lands in question was designed and expected to be also permanent. There could, therefore, be no just measure of compensation, but the whole value of the lands, with the damages for relinquishing them; and that being paid, justice could not be done to the corporation of the city without allowing the latter to hold the lands, as the act provides, in fee simple absolute."

Now, then, apply that for a moment here. Here was a perpetual corporation, for perpetual use, to take toll forever.

They were paid forever.

In Paige's Reports, vol. 5, p. 137, Varick vs. Smith and

the Attorney-General, we find the following: —

"Where a dam is erected upon an ancient stream to obtain a head of water for the use of one of the State canals, the surplus waters of the stream, not wanted for public use, and which continue to flow over the dam and down the ancient channel, cannot legally be diverted by a lessee of the surplus waters of the canal to the injury of the owners of mill privileges on the stream below the dam."

That was one matter that was under consideration.

"The State took for public use one one-hundredth part of the water of the Oswego river, which was private property. In taking this the position of the whole water was changed. This change neither divested the owner of his title, nor gave the State any right in and to it. The original owner is bound not to use it in a manner which is incompatible with the public use; but he is obliged thus to use it in its changed position, and is not thereby wholly divested of his right."

But where the State does this act itself there may be reversion. And there is a pretty instructive case in the Law Reporter, 14th volume, page 167, People of the State of

New York vs. Hugh White.

"Where land belonging to a citizen was taken under the act of 1819, for the construction of the Eric canal, and used as the bed of the canal for a number of years, and was afterwards abandoned by the State, and a canal located in a different place; such land, when no longer necessary for public use, reverted to the original owner, although the act under which it was taken declared it should vest in the State

in fee simple."

"There is another ground on which I think the plaintiffs' title cannot be sustained. The defendant has had no just compensation for his land. Compensation was made to him on the supposition that he was to be benefited by the location of the canal on his premises, and it was only the damages over and above such benefit that were awarded to him. The benefit has now ceased by the abandonment of the canal, and the compensation can no longer be regarded as justly made."

That was a direct abandonment by the State. This was an abandonment by a corporation, and it illustrates the difference exactly. Now, it will be observed that the question is: These gentlemen took their title, it is said. They took it, perhaps, without knowledge of this. In the case of Talbot, he clearly had knowledge, for it was reserved. But in the case of Voorhees vs. the Presbyterian Church of

Amsterdam, 8 Barbour, 135, the Court hold, first, that where a church property was taken in the name of the individual trustee, it was held in trust for the church, and that whoever bought the pew must take notice of that title.

"The evidence showed that the plaintiff, S. Voorhees, had knowledge of facts sufficient to put him on inquiry as to the trust in favor of the corporation. It is a well-settled principle, that if a party acts in the face of facts and circumstances, which are sufficient to put him on inquiry, he acts contrary to good faith, and at his peril. The plaintiffs, therefore, do not bring themselves within the fifty-fourth section of the article relative to uses and trusts. They are not purchasers without notice of the resulting trust in favor of the corporation, within the meaning of the section. The conveyance of the pew in question to Voorhees described it as being in the new brick Presyterian Church, in the village of Amsterdam. The church was erected as a house of public worship for the members of the Presbyterian Church of that village. Voorhees was bound to inquire to what religious corporation connected with the Presbyterian denomination the church referred to in his deed belonged, and what interest such corporation had in the church."

And therefore they charge him with notice.

Now, if I am right, — and I cannot see how I can be otherwise than right in this, — then there has been no reversion

of this property.

But another curious question, if reversion comes in, would be raised. Mr. Whipple was the owner of this property when it was taken. He sold so much out of the river, and a new quantity of water reverted to him in 1862, after he sold to Mather and others. Whom did that belong to? Did it revert to him or to Mather? Mather bought it in 1867. The new quantity of water that did not belong to him was put into the stream by this means. It was turned back. Did that belong to him or to Mather? But I insist that there is no doctrine of reversion. And this applies to everybody clear down to Lawrence.

This question is before you, gentlemen. We rely upon it with some degree of certainty. We believe that you cannot give damages here at any rate. We shall ask you to let the facts so appear that we may be able, by an objection to the acceptance of the report, to get at the law without the necessity of going through with the intervention of a

jury on all these points.

Now, I believe I have brought to your attention all I need to upon these several cases. And I only desire to say that my instruction is,—and I am acting for the city in that

regard, - that they desire to pay only that which is just and right; and they desire to pay that; and they are willing to pay that; and, as trustees to the public, they are not willing to pay any more. They do not believe that large sums of money ought to be transferred from their treasury to these parties, which would accumulate before any damage was done to them, substantially, - for it is a question of subdamage, - would accumulate to a very great And while I bow to the decision of the commisamount. sioners, as announced by their chairman, that this taking is of all the water in the Sudbury river, and that the word "withdrawn," in the statutes, only refers to a time and means to fix a time within which a complaint is to be brought; yet I still think that, upon the question of substantial damage by the taking, the Court have a right to look at in what manner and how it will be taken. For instance, suppose you take none until next September, or only take a few gallons until next September or October, or the year when our dam is to be closed, — is it to be possible that we shall pay for water which they enjoy? Suppose, in the building of these reservoirs, we had knowledge, as one of the witnesses, Mr. Shedd, agrees, that reservoirs on the stream store up a great deal of water, and make the water a great deal steadier, and we are going to make those large reservoirs, — is not that a fact to be considered? It is evident that these two streams are very much better from the making of reservoirs; and I insist again that that does not belong to anybody; that they are only entitled, in the language of the Faulkner and Talbot petition, to the natural flow of the river.

The case which your Honor called my attention to, of the house in Cambridgeport, where the two were built together and joined without any partition wall, and the city cut down the one, I don't think that that is material upon this, if that is put upon the ground that one part of the house was entitled to the support of the other by the contract, and the agreement to build the other. But where is the contract?

Commissioner Russell. I think you are in error there, General Butler. I think it was not put upon any right, but expressly upon other grounds than that of right to support.

Mr. Butler. It was not put upon the ground that it was a right to support, that it would be a party-wall, but that the two parties built the two houses together, under an agreement; and the Court said it was but equitable that the house should have the support. I don't remember the name of the case, but your Honors may look it over. The way I distinguish it is: Here there never was a community of interest. There is no obligation on anybody. It cannot be predicated

for a moment in regard to these reservoirs. Does not Mr. Simpson change his mill-dam at will — take it up and put it down? Cannot he open it and leave it? Cannot Mr. Talbot open and leave his? Cannot the Wamesit Company open and leave theirs? And have the Middlesex Company a right to complain? Not at all. They cannot complain against anybody for doing it. Can Mr. Talbot or Mr. Simpson, either of them, call upon those below to aid him in keeping up his dam, on the ground that it will make more water for them? Well, clearly not. Then how can anybody claim to have any such ownership in that advantage as to give a right to damages? But it is said that, when they bought the property, they bought it with the expectation that in the ordinary course of events they would have so much water made by the dam, and that when anybody alters the ordinary course of events, that is a damage. I say, damnum absque injuria. It may be a loss. For instance, suppose I buy a detached piece of property in Boston, and my neighbor goes and buys a whole square. Its value is because of the trade that is in all the neighboring shops that attract trade there. But my neighbor chooses to go and buy the whole square and tear down all the buildings, and lay it out in pleasure-gardens. Cannot he do it without my calling upon him for damages? And yet I bought the property in the reasonable expectation that the shops should stay there.

Commissioner Russell. Now, General, if the city took your property before your neighbor did that, would you say that was one of the probabilities to which the jury were to look in assessing the damages for that taking,—that they might tear down the shops in the neighborhood, and lay the

land out for pleasure-gardens?
Mr. Butler. Oh, no, sir.

Commissioner Russell. That is what I understand to be

precisely the point of that case.

Mr. Butler. Oh, no; I should not say that. You would be carrying that analogy too far. But suppose that my neighbor took away some of the trade which was brought there because of my neighbor's store, and to which I had no claim, and in which I had no property and no good-will; I should not think that, when my neighbor's property was taken by the city, I was entitled to the good-will of that trade. That is all. That is the difference. Do I make myself understood? My meaning is this: Here is a quantity of water to which they have no title, and they, as riparian proprietors, ask for what they are damaged. What is your right? To have the stream flow as nature made it. That is the only right they have under heaven. They can sue nobody except

for an alteration of that right. They have no claim upon anybody except for an alteration of that right. Now, then, it is said that, having something beyond which they have no right to, which they cannot object to if it is taken away from them by anybody whatever who has the right in his possession — that if somebody else takes that away which they have no right to, and which they cannot object to the owners taking away from them — then they are going to sue that somebody for it. That is the proposition, is it not, sir? Is not that the very proposition? Here is this extra water, to which they have no right, -i. e., they cannot interfere with anybody on earth who owns it doing as he pleases with it, except so far as he does not flood them with it against the course of nature. Now, then, having no right to it, not being able, as against the owner, to sue him for taking away that which they have no right to, the proposition, as a legal proposition, is that they must sue a third person for doing that which they cannot sue the owners for doing, or one not claiming under the owners. I cannot see how that can be stated logically. It is not that this does not make an estate more valuable. That is not the point I put. But it is not a value that you have any right to. It is like an underground stream of water into your land. It makes it more valuable, and if your neighbor cuts it off you cannot sue him for doing it.

And now, in the case of Parker —

Commissioner Russell. But if a stranger cuts it off you can?

Mr. Butler. Pardon me. I was going right on to the 4th of Cushing, - Parker and the railroad. I have not lived all this time without knowing that. I have heard a great deal of talk about Parker and the railroad. They did not say that at all. What they did say was this: That where I have appropriated in my well an underground stream of water, whatever my neighbor might do, that a railroad shall not cut down and drain that well, - shall pay all damages. That is every word there is of Parker and the Boston and Maine Railroad; that here was a man that had a well by the side of the railroad. He had stored up the water in that well, and the railroad cut down close by it and drew the water off; and while they would not decide what might be the rights against the proprietor of the land, - whether he could do it, yet, after paying all damages that were done — All damages to what? All damages by laying out the railroad and constructing the railroad, - that that draining of a man's well was a damage that they ought to pay for. It was just the same as though they had tipped over his water-pail after he had taken his water up upon the surface. I would say that precisely in the same way — that he would have a right of action. But that is not this case at all. Nor is it the case where you cut off an underground stream that nobody knows of, and that never has been appropriated. That never has been decided in this Commonwealth yet. But here was a case where they drained and appropriated an underground stream and appropriated a well, and that makes exactly the difference.

But we need not follow the course of analogy. The question is simply this: I am a riparian proprietor on a stream. I can only claim the right to have the water flow in a state of nature. I can claim no prescriptive right to have my neighbor flow it above me so as to supply it more. I can claim no prescriptive right to have my neighbor refrain from pumping it below me so that it will flow off more than it did in a state of nature, and drain so that it will flow off more than it did in a state of nature. Very well, then, my right is to have it in a state of nature. Somebody thereupon interferes with my right. Precisely, my right to have what? Why, my right - nothing more. Well, but I say, "I want something more than my right. I want you to pay me for the advantage that my neighbor up there has been to me in making so much water by flowing." Would it not seem to be natural justice that you should pay him, not me? He spent his money. He built the dam. Why don't you pay him? Not me. It came from him. It belongs to him, if it belongs to anybody. It belongs to him, not to me. You say you pay me, because my property is made more valuable by what he has done; but I have no right to have him occupy there. Very well, then, why should you pay me? Why not pay him? I cannot conceive of a title under the circumstances that I put. I think Coke on Littleton does not show any, so far as I remember. I don't believe Greenleaf's Cruise has a chapter devoted to that sort of title; and I suppose a man ought to have some title before he complains of any damage. It is an old-fashioned notion I have got, and it may not be according to the new doctrines of the present age. It is the first time in my life that I have ever heard, or supposed it would be claimed, that a man could be paid for what he did not own and could not get, except by sufferance. It is not as is said. I think the mind is led away by the analogy. It is not that you take any benefit from him that belongs to his estate. The point in the trouble is - the point of departure is - that the benefit does not belong to the estate. It no more belongs to the estate than the dog running over it belongs to the estate, or the horse trotting over it belongs to the estate. It is of that class of injuries, and that class of benefits, which fall by the natural change of events, — like the inn that is destroyed by the new turnpike, like the new turnpike that is destroyed by the new railroad, or like the new railroad that is destroyed by the canal. They cannot complain, either of them. The old tavern became worthless, because the new turnpike carried trade by it. The new turnpike became worthless, because the railroad took away all the travel. Yet the value of those estates was much greater before the change. But the trouble is, that the change took place by reason of matters over which they could have no control, — by change in property in which they had no right.

However, the question is with you. I beg pardon for arguing so much at length; but I am very anxious, if I can effect it, that these cases never should be tried again; and I hope that there may not be such an award that the city will feel it their duty further to press it, or I shall feel it my duty

further to advise the parties.

[Adjourned to Saturday, November 4th, at $10\frac{1}{2}$ o'clock, A. M.]

Saturday, November 4.

The commissioners met at $10\frac{1}{2}$ o'clock.

Mr. Child. Having now the deeds spoken of yesterday, I desire to call the attention of the commissioners to the Sturtevant matter.

Mr. Shattuck. I think your mistake comes from the fact that you did not use that deed.

Mr. Child. No.

Mr. Shattuck. Go on, then.

Mr. CHILD. By the deed of April 2d, 1844, the Whitney mills conveyed to J. D. Sturtevant, all the lot of land conveyed by Warren, Barry and Parke to Clements, by deed dated October 1, 1832; also, another lot of land south of and adjacent to the foregoing, with an easement to a canal across said corporation land, with exclusive right of using the same to carry the wheel.

Now, J. D. Sturtevant conveys to Ephraim and George Crosby the same description as in this deed I have just read, with all the privileges as in the deed to Clements.

Commissioner Russell. Does it include that easement? Mr. Child. It does not say. The easement, as I understand it, is as in the deed to Clements. "Hab, in fee, with all privileges as in deed to Clements," is what it says in this

deed to Crosby.

Now, your Honors will remember that yesterday I said that Alpheus Smith's interest came back to the Belvidere mills, subject to saw-mill, to Abner Ball, and to Sturtevant. The exact state of facts in regard to Sturtevant is this: Warren, Barry and Parke conveyed to Hale Clements threetwenty-fifths. Hale Clements' shares, through various conveyances, got into the Belvidere Woollen Company. One of the conveyances by which Hale Clements' share got to the Belvidere Woollen Company was this one to Sturtevant. Now, Sturtevant had conveyed to him, by the Whitney mills, Hale Clements' three twenty-fifths; and also, as I have read before, a lot of land, "with easement to a canal across said corporation's land, with exclusive right of using the same to carry the wheel." That was in addition, over and above Hale Clements' three twenty-fifths.

Commissioner Russell. A lot of land, also?

Mr. Child. A lot of land with it. Now, Sturtevant conveys to Crosby the same description as in the deed of April 2d, 1844, "with all the privileges as in the deed to

Clements." Therefore, I claim that Sturtevant did not convey to Crosby the "easement to the canal across the corporation's land with exclusive right to use the same to carry the wheel." Then Crosby conveys to Richmond, Richmond conveys to Church, Church conveys to Ripley & Hammond, Ripley & Hammond convey to Ripley, and Ripley conveys to the Belvidere Woollen Company. So that there still remains outstanding this "easement to the canal across the corporation's land, with exclusive right of using the same to carry the wheel," in J. D. Sturtevant.

Commissioner Russell. What has J. D. Sturtevant got

to use the wheel in?

Mr. Child. They have not given us the deed. All they have given us is just this statement.

Commissioner Russell. Does the deed convey the lot of

land which Sturtevant had?

Mr. Child. I don't know whether that is conveyed or not. It may or may not have been. As far as proved, they have put in the same description as in the deed, lib. 452, fol. 18. Then there is this addition: "Hab. in fee, with all privileges as in deed to Clements."

Commissioner Russell. I think it would be well to let us have the deed. We do not know whether that is the language of the deed itself, or merely a note by the compiler.

CLOSING ARGUMENT OF GEORGE O. SHAT-TUCK, ESQ.

It has been said here by the counsel for the city that our claims are exorbitant, and the commissioners have been cautioned against finding in our favor any large amounts, on the ground that the counsel for the city will not feel justified in approving the payment without further litigation. That is not, of course, a proper argument to address to this tribunal; but, having been made, it is proper for me to allude to it. The charge that our claims are exorbitant rests wholly upon the statements of counsel. It is well known that before the City of Boston took this water there was a careful investigation made by competent persons in behalf of the city, and estimates were made of the cost of constructing the works, and of the amount of money that would probably be required to pay for the water taken; and the counsel in the case have undoubtedly had the benefit of those investigations. I think I am not going too far when I assume that the eminent engineer for the City of Boston has investigated this matter and reported upon it; and if our claims had equalled his judgment, or certainly if they had exceeded his judgment, it is fair to assume that he would have been placed upon the stand to show it, and that it would not have been left to the counsel alone, without any backing of testimony, to contend that we have made exorbitant claims. So much for the preliminary statements by the counsel.

I now come to one or two questions of law which I did not consider in my previous argument. I should not take the trouble to consider them now if they had not been so earnestly pressed by the counsel for the city. One of the legal questions raised is whether the Commonwealth, through the Middlesex Canal Company, does not own this water, and whether we have any claim upon it. It is a sufficient answer to that to say, that more than twenty years ago the Middlesex Canal Company abandoned its right to use this water; that the old canal has been converted to other uses; and that persons have acquired adverse rights; that we have acquired adverse rights, and that a party to-day succeeding to all the rights of the Middlesex Canal Company could interfere in no way with our privileges. The theory that this property of the Middlesex Canal Company was seized by the Commonwealth has no foundation in legal principle. It is based wholly on confusion as to the meaning of the word "franchise." The word "franchise" has a double signification; that is, it means sometimes simply the charter, — the right to be a corporation, — the right to do certain things. It is also sometimes applied to the easement of a corporation, which may be considered its property. Now, when this corporation was dissolved, its right to be a corporation—its franchise, in that sense went back to the Commonwealth, the author of its being; but its property did not. There is nothing in the decree of the court dissolving the Canal Company, nor in the action of the legislature confirming the decree of the court, which tends to show that anything more than the mere naked franchise — the charter which the legislature gave to the corporation — went back to the Commonwealth. That did not strictly go back to the Commonwealth, but was simply destroved.

There is another proposition of law which the city has contended for in this case, and which, against our protest, has been recognized, which settles this question. We said, "The City of Boston takes the right to all the water in Sudbury river, and they must pay for the whole of it." The city answered, "No; although we take all the rights, you shall be paid only for the actual damage done to you," and such has been the decision. Now, if you assume, for the purposes of this argument, that the Commonwealth has a right to the Middlesex Canal franchise, how much harm would it do us? Would they ever use it, practically? Would they ever divert a drop of water? You may credit the city with all that you believe, as practical men, would be the damage to our water-rights by any assertion of the claims of the Middlesex Canal Company by the Commonwealth of

Massachusetts, if you choose, and then we are safe.

There is one other point taken by the city, and that is, that we have a right only to what is called "the natural flow." What "the natural flow" was is something that it is not worth while to discuss, because we are entitled, when we claim compensation, to the market value of the flow as it is. If the Commonwealth should destroy one of those reservoirs, or tear down one of those dams in the upper part of this river, which we have not any right to maintain, we might claim damages, if it interfered with our use of the water, or made it less valuable than it was. This is the law according to the decision, as I understand it, in the case referred to, Marsden vs. Cambridge, 114 Mass. In that case there were two houses built together, each supporting the other, but neither owner had any right to have the support of the house of the other, and either might have taken his

house down, and left the other unsupported. One of the houses was taken away, and the owner of the other claimed compensation. The opposing party said, "You have no right to compensation. You had no right to have that house stand there." But the Court said, "That is not just. It was for the mutual advantage of those two parties, and the removal of the house was an injury, and, therefore, you must pay." Now, we say we have a right to this water; and our case is such as that would have been if the man's own house had been taken, and they had said to him, you cannot have any substantial damages, because it was liable to tumble down when the other man took his house away. That is the precise distinction.

Now, this is fundamental. The value of property every day depends on considerations over which the owner has no legal control. Every man knows that the United States might to-morrow cut off the wharf accommodations of every wharf in Boston, and they could not recover any compensation for it; and yet everybody values the wharves with reference to the use of the water. So my house is on a highway. That highway is a public easement. In the absence of statute the sovereign power, the Commonwealth, could discontinue that highway, and I should not have any compensation; but is my house, therefore, to be valued on the theory that I have no right to a highway there? Certainly not. It is not an argument which I shall take any

further time to discuss.

I now come to questions which, in part, were considered in my former argument; and, therefore, I shall not detain you by considering them at any length. The first question is, how much does the Sudbury river contribute to the Concord river? We say 22 per cent. They say one-tenth. What do they base it on? They refer to Mr. Fteley's measurements for a few dry months. Mr. Fteley tells you distinctly that the value of those measurements is not sufficient in any way to modify the general rule that the watershed is to determine the proportion. Mr. Shedd, who has examined the river, and knows all about it, makes the same statement, and there is not any testimony to the contrary. But Mr. Herschel says he has a theory about large rivers, which you have heard. Now, I do not intend to waste any time in the consideration of that question. I still fall back on the testimony of Mr. Mills, who says that the watersheds should govern, making allowance for the evaporation which increases the percentage. Mr. Shedd says so; Mr. Fteley says so, and nobody says the contrary.

I next come to the question of the amount of water at the

Wamesit dam, and upon that question I shall say very little. We have there unquestionably the best evidence that has been produced. We have the measurements of Mr. Tilton for over two years, showing the depth of water on the Wamesit dam. We have the actual measurements by Mr. Herschel and Mr. Frizell, showing how much water ran in that river at particular heights of the water on the dam, which enable us, as Mr. Mills did at Lawrence, to spread those measurements which were taken during two months over the whole two years during which Mr. Tilton measured. The arguments against us come first from the water which they say is shown at Saxonville, the water shown by Judge Abbott in the Talbot cases, and the amount that is used, as they say, at the Wamesit dam; and I propose briefly to consider those.

First, take Mr. Talbot's case. I have read over all the evidence, I believe, in that case, and I have read over Judge Abbott's argument. It is a fair argument, based on the statistics which he had at his command. The city were not kind enough to furnish him with this instructive testimony which they have given us, and the argument, it seems to me, is as sound, as fair, and as reasonable as could be made upon the premises; but our evidence tends to show simply this, that the Sudbury meadows have a greater effect than I think any of us who were acting as counsel anticipated in distributing the flow of water over the different months and days in the year. Judge Abbott assumed six months as the time when he would be injured, and the other six he supposed there was an excess of water; but the evidence in our cases shows that there is no month, no week, no day, in fact, in the whole year when, at the Wamesit dam, we may not be short of water; and it seems to me, as Judge Abbott said yesterday, that the time in the case of Mr. Talbot, during which he will suffer loss, ought fairly, upon the evidence which has since been introduced, to be extended for a period of more than six months.

Now, as to the water used at the Talbot dam, some of the considerations which were presented by Gen. Butler are wholly without any basis of fact. There is no evidence tending to show what is used at the Talbot dam, except this. Mr. Talbot uses his woollen mill with fourteen sets of machinery. He put the amount used by each set of machinery at 10 horse-power, — probably a pretty large estimate. Our measurements show less, even where we have swift running machinery like his. That would take about 140 cubic feet per second on his fall of 11 feet; probably 120 feet on the wheel is more accurate. There is

no evidence to show how much he runs his dye-wood mills; but I suppose he does not run them when there is any want of water, and he apparently stops them rather than interfere with Faulkner's mill, because it is plain, upon the evidence. that Faulkner's mills ran more than the dye-wood mills did. What Gen. Butler relied upon was the statement that there were to be 405 cubic feet per second running before the Talbot mills could be stopped, if the water was below the bolt; but there is not a syllable of evidence from anybody that Mr. Talbot ever got 405 cubic feet per second before the water came up to the bolt, and there is nothing that This I will repeat, because it seems to tends to show it. me to be important. When the water is below the bolt, Mr. Faulkner has no right to stop Mr. Talbot, unless he is drawing more than 405 cubic feet per second, and he never stopped him; and Mr. Talbot never drew 405 cubic feet per second. Mr. Talbot is very careful. I will take the trouble to refer to his testimony. Mr. Talbot, I say, spoke very cautiously in his testimony here, as you will observe, on page 391:—

"Q. How large a part of the time, if there is any time, when you have absolutely stopped the whole day the dye-wood machinery? I am speaking of the working day.

"A. We have to stop occasionally, but the water must be very low for that (that is, to stop all the time). We have not had to

stop very much.

"Q. Unfrequently when you have stopped every part? "A. Frequently we do.

" Q. Frequently you do?

"A. Yes, sir."

That is, frequently he stopped part. You know Mr. Faulkner only stopped his machinery some thirty or forty days.

"Q. How large a part? I mean now the working day.

"A. Sometimes we run part of the day, and sometimes we have to stop all day, but we can generally run some portion of a

"Q. That is what I want to get at. So that the stopping your

dye-wood machinery all day is quite unfrequent to you?

"A. Yes, sir."

Then, on 403d page: —

[&]quot;Q. But you can only take an aliquot portion of the water?

[&]quot;A. We can only take a certain amount.

[&]quot;Q. How large is that amount?

- "A. It has been estimated at about 400 cubic feet of water per second.
- "Q. And when did you begin to be restricted to that amount? "A. Well, in the past we have never made any fixed rule about it."

So here is a right to limit Mr. Talbot, when the water is below the bolt, which practically amounts to no limit at all, because there is never so much water running when it is below the bolt, and therefore it throws no light upon this question. So much for Gen. Butler's argument in that behalf. The only thing that is shown is, that Mr. Talbot runs his woollen mills, and Mr. Faulkner draws away about fifty feet per second, the larger part of the year. That testimony remains uncontrolled. Then at times they stopped the machinery, and they run these dye-wood mills to a greater or less extent.

Then we come to the Saxonville mills. Now, as to that,

I see nothing conflicting in that testimony.

Mr. Child. I suppose you want to get the testimony correct.

Mr. Shattuck. Certainly I do.

Mr. Child. Mr. Holmes testifies on the deposition that was introduced as showing the amount of power that Mr. Talbot has, that he has measured the gates, and that it amounts, putting the grist-mill and saw-mill together, to 405.52 cubic feet per second.

Mr. Shattuck. That is what I have just said. According to the deed, if you will refer to it, Mr. Talbot cannot be limited in the amount he is to draw when it is below the bolt, unless it comes up to that amount; and nobody testifies that that amount ever ran in the river when it was below that bolt. Therefore it is of no consequence.

Mr. Child. But the gates are higher.

Mr. Shattuck. That is true. The Talbot deed refers distinctly to those gates, which were measured in 1833, and says, "You cannot stop Mr. Talbot drawing when the water is below the bolt, unless he draws more than that amount;" and they never stopped him.

Mr. Child. The water when it is down to the bolt is

higher than the top of the gates.

Mr. Shattuck. Not the gates as they are now; the gates as they were then, in 1833.

Mr. Child. The gates are bigger than they were, as I understand it.

Mr. Shattuck. The commissioners have heard the testimony; I do not care to press it any further. All I mean to

say is, that if anybody can ascertain from anything in Mr. Talbot's case, that any more water is drawn there than our testimony shows is on the Wamesit dam, I have been unable to find it.

As to the Saxonville dam, I have no doubt from the evidence that there is a vast amount of evaporation in the dry season, much more than the highest estimate made by Mr. Frizell. Mr. Shedd tell us that the water-table of the Concord river, which rises and falls with the level of the river, extends not only over those meadows, but miles back beyond the meadows. And the amount of evaporation estimated on the surface of the meadows, as Mr. Frizell did, was undoubtedly a very low estimate; probably it would not be more than half. Now, I say that the influences affecting the wastage and the evaporation, from the time the water leaves the Saxonville dam to the time it leaves the Wamesit dam. are so great, that the amount of water at one place does not aid us very materially in determining the amount of water at any particular time at the other place. It is a little important to remember on the whole question of distribution, that in this country the evaporation from a water surface, or from a wet meadow surface, in a year, is greater than the rainfall. somewhere seen it so stated; in England it is said to be less than the rainfall. Now, I have observed, in looking over some of the measurements of Mr. Tilton, that there was no water running over the Wamesit dam during the months when the rainfall was the largest. Although nature has never worked in that way, I have no doubt that it would be practicable to have all the rainfall of the season so distributed as not to contribute a gallon of water to those rivers. It appears that an inch and a half rainfall did not affect the Concord river at all; it was not perceptible at all; and you know that there may be a pretty large rainfall that will not show any effect on the surface. It may affect the springs. How that is, it is not necessary to consider; but it is wholly a question of distribution, and the difference in the influences on the distribution between Saxonville and the Wamesit dam is so great, that I consider any testimony affecting one of very little value as affecting the other.

Mr. Child. I hope you will excuse me again.

Mr. Shattuck. Certainly. I am very glad to have anything that is instructive.

Mr. Child. Mr. Holmes says, on page 409:—

[&]quot;Q. You have given now the gates that you have estimated upon, and the head under which you have estimated it by the deposition?

"A. Yes, sir.

"Q. Now, did you get from Mr. Talbot the discharges from his wheel, by its present use, as he gave them to you?

"A. Yes, sir.
"Q. Taking it as he gave it to you, will you give us the amount of the number of feet per second which they discharged - the six wheels, the whole? Thus, there are six wheels that he has in all that you estimated upon.

"A. Eight wheels.

"Q. Give us the six of the dye-wood wheels?

"A. I have them all together, and not separated. The number of cubic feet per second discharged by all the wheels is 420.5 for eight wheels."

Mr. Shattuck. There is no evidence that all those mills ever ran together when the water was below that bolt three-quarters of an inch; none whatever. I have looked that over carefully to see.

I need hardly refer to the evidence on the question of the use of power at the Wamesit dam. The mills that have bought water-rights use 220 cubic feet. The mills that are guaranteed use about 103 cubic feet, —I mean have a right to use 103 cubic feet, — and there are some mills not guaranteed. Add the 103 to the 220 and you have 323 cubic feet. The Bleachery does not use more than six or eight cubic feet at the outside. Deduct that from thirty-six, and it leaves twenty-nine, more or less. The Belvidere mill has not been running for a year and a half. Almost always some of those mills are not running. Wood's mill does not get its fair share, everybody concedes. Now, deduct this from the whole amount, and you will find that there are only about 260 cubic feet per second in actual use, that is, the actual guaranteed use of the Wamesit dam; so that there is nothing in that on which to base any argument as to the quantity.

Now, as to our evidence. As I say, we have spread the measurements made by Mr. Frizell and Mr. Herschel over two years by using the measurements of Mr. Tilton; and they show that for eight months and twenty-four days in one year, and eight months and ten days in another, the flow of water was so small that our mills were materially affected by it, and that during about six months in each year we lost the whole of our proportion of what the city takes. That is the best evidence which has been offered here, and there has been no evidence by anybody tending to controvert it; and if the commissioners should venture to make any deduction from that, on any theory of a larger flow in other years, they run the risk of doing us a great

injustice.

I have nothing more to say with reference to this matter of the flow. I shall assume that about twenty-two per cent. is taken of the water on the Wamesit dam, and I now come

to the question of damages.

Some of the argument upon this point was interesting and admirable, it seems to me, as an example of ingenuity. Let me illustrate it. General Butler says that the Essex Company, from whom the water was taken, cannot show that the value of their whole property is diminished, or that their stock sells for anything less in the market. Now, suppose the City of Lawrence had taken an acre of land from the Essex Company, on Essex street, and the question was what the damages were, and the City of Lawrence should contend that the whole property of the Essex Company would sell for about as much as it would before; that they did not believe their stock was diminished in value, and therefore they ought not to pay anything; what would any court or jury say to that? I have no doubt that such an argument as that might be made with as much force as the argument for the city in this case. We are held up to ridicule here because we have not attempted to show what the market value of the property of the Essex Company and of their stock is, and whether it is diminished by the taking of this water.

The argument is precisely such as it would have been if one acre of land had been taken, and that argument had been pressed upon you. The question always is, in these cases, what is the market value of the thing taken? And upon that we have all of us put in evidence, and the city has not offered a syllable of evidence of any kind to contradict ours. Again, he says, "You are not using your water." Well, suppose, again, the City of Lawrence had taken an acre of land from the Essex Company - vacant land - and they had said, "Why, here you have owned this land twenty-five years. You have not used it or sold it, therefore we will not pay you anything for it." The true principle is, that we are entitled to the full market value of the thing taken, in any case. That is the lowest limit to which you can go, and I may as well say this now, once for all. Take the Massic fall, or Mrs. Richmond; take the Essex Company, or any of these cases; and when they show you the market value of what is taken, and the city come in and make themselves, by force of law, the purchaser, they must pay that market price, whether it is land which we have allowed to remain vacant for twenty-five years, or water which we have allowed to run in its natural course for twenty-five years.

Although the market value is the lowest limit, it is not necessarily the exact measure, or the full measure, of our claim. If we have placed a building upon land, and that is so situated that practically it will cost more than the market value of a certain amount of water to do us justice, and put us where we were before, and the amount which we claim for that does not exceed the whole value of the property, then we have a right to that measure of damages. We have in that case no question of the market value of the property. Suppose, for instance, a man takes a wheel from my wagon, and I bring a suit against him for conversion. I am not bound to show that the market value of my wagon with all the wheels on it was so much, and the market value of my wagon with one wheel gone is so much. I cannot show it. What I should show would be the market value of the work and material to be furnished to supply the loss, and unless that amount exceeds the whole value of the wagon after the wheel is put on it, I am entitled to that as damages. Of course, there might be a case where a wagon was so poor that it would not pay to put a new wheel on it, and in that care you would not allow that amount; but unless that does exceed the whole value of the wagon, after the wheel is put on it, I have a right to show the market value of that wheel, and that is to be the measure of damages.

The Sterling mill is selected for ridicule here for claiming exorbitant damages. Now, I thought, looking over the calculations of the others, that the Sterling mill was one of the most modest of all these claimants. But let us take the Sterling mill, and take Gen. Butler's own statement, and the evidence in this case. The value of land in any city, or in any locality in this country, began with zero, or the belt of wampum, and it has gone up to \$100 a foot in State street, step by step, just as the demand has increased, and the supply in proportion has been diminished. When they began in Lowell, water-power had, I suppose (I have no knowledge historically), simply a nominal value. It has been going up all the time, and the limit of its value will be the cost of steam-power. There is no other practical limit. Now, see how this is illustrated. In 1857, this land where the Sterling mill is, with the water-rights, but without the building, was sold for \$15,000. In 1864, it was let for fifty years, a building to be placed upon it, for a rental of \$1,400 a year, taxes, and all assessments. Now, such a lease as that, as an investment, with the buildings upon it, is as safe a security as can be found in Massachusetts, and as valuable for trustees, when you take into account the period during which it is to run. To-day, I have no doubt, such a security

as that would sell on a basis of capitalizing it at five per cent. It is just as good as a Massachusetts bond running for thirty years. But even at six per cent., that property had gone up to \$24,000, and at five per cent., \$27,000 or \$28,000. That was the value in 1864. But when we come down to 1876, we find that the Wamesit Company is leasing power equivalent to this, without the land, at \$15 per horsepower, which gives us, for thirty-six feet, \$5,400 annual rental; and when you include the land which we own, and the value of which depends on the use of the water, \$100 per horse-power, it gives an income of \$7,200 a year for this power, without the buildings and machinery. That is the market value; and, as I understand it, business in Lowell is increasing, the population is increasing, more mills are going up, the old mills have been enlarged, and the value of this power is growing day by day. But taking it at the nick of time when the city happened to hit it, and it leaves, according to their evidence, \$5,400 a year, without the land; with the land, without the machinery, \$7,200 a year, which is a sum equal to the value of more than \$100,000. That is the value which the evidence shows. Now, the General says here, "Why do they not show market values?" We have shown market values. If there was any other value to be put on this property, why did not the city bring their witnesses? The only man here who has undertaken to testify as to values in this case is Gen. Butler himself. He has brought in statements about the sale of the Middlesex mills in 1857, and brought in statements about some sets of machinery, which he says sold for little or nothing. This is wholly incompetent. This case is to be decided upon the evidence, and upon their evidence as well as ours. The price put on this property is in no way exaggerated. What a mill abandoned, a mill stopped, rusted, the capital all gone, the help all discharged, everything in that condition, sells for under the hammer, - a way in which no solvent man ever dreams of selling property of this kind, - what such a mill would bring, I do not care. It is what a live mill, with capital and intelligent business capacity, and industry behind it, will sell for. Why, the difference is the difference between what a ship dismasted, dismantled, lying in the dock, needing every kind of repair, and all its furniture, would sell for, and what a ship furnished every way, just starting out of port, with a valuable charter, equipped, manned, every way complete, would sell for. The difference between the two can hardly be measured. There is no comparison. So here, we ask you the fair market price of a mill held by a living, solvent corporation, and what we

could sell the water for, if we became insolvent, in this particular locality. I have not heard, some of the commissioners may know the fact, that the mills in Lowell, where they have water-power, have been sold lately at any very great sacrifice. Water-power is in demand there all the time, and has a value. I don't know what the value of water in Boston may be to-day, but, as I understand it, the rates at which the City of Boston has been selling it, one foot of water over this Wamesit dam, for manufacturing purposes, brings more than \$50,000 a year.

Mr. Child. There is no testimony about that.

Mr. Shattuck. No, sir; that is matter of general knowledge. Call it anything you please. Everybody knows, generally, what water-rates are. Of course, we do not claim that price. We do not ask to be paid anything like that; but it is significant in determining whether the city will be likely to take all the water when they get a conduit leading to Boston; when they have taken the whole of it on paper, and when they have not offered one syllable of testimony to show that they do not expect to take the whole of it, and take it at once. This is a little diversion from the point I am considering, but I may as well refer to it now as at any time.

Once more, as to this question of value. We are entitled to the market value of the water taken, in any case, whether it is used or not. The damages cannot be less than the market value of the power taken on the spot. And if, to a prudent and reasonable man, the economical method of preventing loss is to supplement his water-power by steam, the measure of damages is the cost of steam. That is the

exact question which I propose to consider now.

Gen. Butler says, "Oh, take out part of the machinery, and go on with a smaller supply of power." And, if that is the best remedy, his argument is sound. But you must remember that we have a mill, prepared with all this machinery, and room for it; we have a superintendent, who can just as well run a mill with one set of machinery more as with one set less. We have all the appliances for manufacturing, which you understand so much better than I do that I will not dwell upon them. And, having all these, what will a prudent man do, looking at it in the most economical way? Let us assume that we have the city's money in our pockets, and have nothing to consider, except the best way to prevent loss, and we sit down, as prudent men, to consult and decide what we shall do. Shall we decide to throw aside part of our machinery? As prudent men, ought we so to decide, or shall we put in steam? Now, there can be only one

answer to that question, upon this evidence. Everybody puts in the steam. Everybody says that is the proper solution of this problem, and the city have not denied it. All the evidence introduced here shows that we shall, as prudent men, supplement this water-power with steam; that that is the only proper solution of this question, and nobody denies it. You are not embarrassed here with conflicting testimony. But I will not discuss this. You know just as well as I do that that is the way that the difficulty is always remedied, and we are therefore entitled to the market value of the steam-power argued. General Butler insists upon that, and I insist on it as strenuously. My brother Storey suggests this question, not only what, as prudent men, they would be likely to do, but what have they actually done in contemplation of such contingencies; and with reference, also, to this particular contingency, what have they done?

Now, we come back to the doctrine which I contend for, that it is the market price which is to determine, and in which I am very glad to have the support of the city. It is the market price. I do not know that I can add anything to what I have said before. In cases where value is to be shown it is always competent to show the cost of anything. But in the long run it has been found, by the Courts in the administration of justice, that the safest rule is not to take what one man thinks he can make a thing for, and another man thinks he can get it for, but what prudent men, dealing with each other, have agreed upon as the fair price to sell and buy for. Now, we did not, after consultation, think it was profitable or useful to take each mill, and go into details as to what must be done here, and what must be done there, showing more or less, but to take the market price of the thing furnished, which the world has found to be the best test, on the whole, of value in any community.

Now, the absurdity of the argument of the city in objecting that we did not show the market price of the whole property of the Essex Company is found in this: There is no market price for it. Nobody ever sold anything of that kind; but they do sell water-power by the horse-power. So, in these cases, it would be very difficult to-day to establish the market price of a mill in Lowell. I don't think you could find any two men who would agree upon it, for the simple reason that they are not selling mills in Lowell now. Nobody sells anything of that kind, if he can help it. There is no meeting of minds upon the value of a mill by parties who are standing upon equal terms. That is necessary to make a market price. You must have a solvent buyer and a solvent seller, who buy or sell because each man thinks it is for his interest

to buy or sell. I do not think you can find a sale of a mill in Lowell within the last ten years upon such terms; but when a man fails or becomes bankrupt, he has to sell under the hammer, whether there is any market value or not. There is, in that case, no meeting of minds upon the fair value - one man wanting to buy, and another to sell. If there has been any sale, it has been a forced sale. Therefore, I say, if you should ask any man what is the market value of this mill, he could not tell you. There is not a man in Lowell to-day who can tell you, or who can give a judgment of any substantial value as to what the market price of a good mill like this, backed by capital, is: but when we come to supplementing water by steam, we are dealing with something that has an established market value in every city of any consequence. And what is it? They have not offered any testimony as to the market value of steam, — not a word. They tell you what the Wamesit Power Company can furnish power for; and did you observe what General Butler, in his argument yesterday, said upon that point? He said that this canal furnishes so much power that the Company can afford to supplement it by steam and sell it for \$75 a horse-power. That is just what we have been contending for. It is not their steam-power they are selling for \$75, but it is a large amount of water-power, supplemented by steam, that they are selling for \$75 a horse-power. I do not give his exact words, but that is the substance of what he said. Nobody can find an instance in which steam-power has been sold for less than \$100 to \$150 a horse-power; and Mr. Frizell (and nobody contradicts him except Mr. Farrington) says that that is a fair price. That is what we claim. do not think it is possible, humanly speaking, for anybody to go into a calculation of the actual cost of steam-power in any particular locality, and cover it. There are items which are always left out in those calculations; but the market price includes them all, and that is the test. \$125 or \$150 a horsepower, - \$150 we say.

I will not dwell upon the point which was made in my opening argument, that you are to provide us a fund which will enable us to meet contingencies as a prudent man will do it. That theory is supported by the evidence of Mr. Farrington, as well as by our own, and in the very long argument made by the eminent counsel for the city it has not been controverted. It is so plain, upon the evidence of Mr. Stott, that I suppose it was not thought to be worth while to attempt to controvert it. He has left us that to stand on. Nor has he denied at any time, or attempted to controvert my position, that we are entitled to 20 horse-power for these

mills, because you cannot furnish power to meet contingencies at anything less than the cost of 20 horse-power; and therefore I still press the claim for that, and my asso-

ciates take the same ground.

I feel, when I consider the magnitude of these cases, and the importance of the interests involved, as if I ought to spend more time in the argument than I have; but my embarrassment, if I may use that term, comes from the fact, that from the beginning to the end of these cases there has been nothing to controvert, except a little theory, somewhat ingenious and pleasing, but wholly unsupported theory, of Mr. Herschel as to the water, and perhaps a little testimony elicited from Mr. Farrington, which was contradicted by himself in the earlier part of his examination. There is nothing here, from the beginning to the end, to meet. It is a plain case of testimony all one way. Our evidence has not been met, not because the city would not have met it, if they could, but because the representatives of the city, sitting here, know it would be useless to try to meet it. stand, therefore, upon our evidence, and if this case is to be decided upon evidence, we are safe for substantially the whole of our claim.

OLD BELVIDERE MILL.

I now come to the case of the old Belvidere mill. was so much said about the title to the property, that I apprehended some difficulty, and I must say that I felt gratified when I found that the vigilance of the counsel for the city had not detected any flaws in our title, except the ones which have been pointed out, and to which I shall now allude. It has been examined with great thoroughness and accuracy, and we stand here to-day with a clear record title to ninety-one one hundred twentieths part of all the water at the Middlesex dam, except that required by the Middlesex Co. for three breast-wheels and a fulling mill. According to the uncontradicted testimony of Mr. Frizell, that company has a right to not exceeding 168 cubic feet per

The first question affecting the title, which is raised here, is as to the old saw-mill. If the ingenious counsel had not suggested it, I don't think any doubt would have been raised in my mind upon the construction of the deed. cannot say that, after his suggestion, there is any real doubt. The language of the deed seems to me to be very plain. Here is the deed from Thomas Hurd to Winthrop How (page 916), dated May 31st, 1821, which conveys the land on the east side of Concord river in Belvidere. I read the exact words: "With the privileges thereunto belonging, excepting the mill privilege where the old saw-mill now stands, the said Hurd reserving to himself, his heirs and assigns, a right to erect and maintain a dam across said river above said saw-mill, where the dam now stands; and also a right to draw and use the whole of the water of said river above said dam at his, the said Hurd's, factory on the west side of said river." How can anything be plainer? He intended to reserve for himself all the water in the river; therefore, when he was selling the land on the east side, he sold it with all the privileges thereunto belonging, except the mill privilege of the saw-mill, so as to secure to himself all the water on the west side of the river. I do not see how anything can be plainer than that. It is clearly to be inferred from this, that at that time there was no water privilege on the east side of the river except the saw-mill privilege. Hurd sold all the land, and all the privileges except the saw-mill privilege, and he did not sell that, because he wanted to reserve all the water to be used on the west side of the river.

Mr. Child. You claim that excluded him from using

the saw-mill privilege?

Mr. Shattuck. Certainly it did. It is as plain as it can be. I will read it again: "Reserving to himself, his heirs and assigns, a right to erect and maintain a dam across said river above said saw-mill, where the dam now stands; and also a right to draw and use the whole of the water of said river above said dam at his, the said Hurd's, factory on the west side of said river." I do not see how anything can be plainer than that. I do not know why my friend (Mr. Child) should laugh. Seriously, I really cannot see where the doubt is.

Mr. Child. I certainly do not understand your theory. Mr. Shattick. Let me read it again: "With the privileges thereunto belonging, excepting the mill privilege, where the old saw-mill now stands, the said Hurd reserving to himself, his heirs and assigns, a right to erect and maintain a dam across said river above said saw-mill, where the dam now stands; and also a right to draw and use the whole of the water of said river above said dam at his, the said Hurd's, factory, on the west side of said river." He reserves the right to take all the water of the river,—to "draw and use" the whole of the water.

Mr. Child. He wants it, and the surplus is to go to the saw-mill.

Mr. Shattuck. There is nothing said about "surplus" here at all. This is the first deed. Then by a paper which is dated the same day, but which was undoubtedly intended

to take effect after this first one, he conveys "to Winthrop How, his heirs and assigns forever, a right to build any mill or mills on the east side of Concord river below the milldam running from said Hurd's factory on the west side of said river to the easterly side thereof; and also a privilege to draw and use the water from the mill-pond above said dam for the purpose of carrying said mill or mills." Now, that is an unlimited right. The intention was, undoubtedly, to have the old saw-mill abandoned, because he says he may "build any mill or mills on the east side of Concord river, below the mill-dam, running from said Hurd's factory, with the privilege to draw and use the water from the pond above said dam for the purpose of carrying said mill or mills" as many as they might choose to build there. "The said Hurd reserving to himself, his heirs and assigns, the first and exclusive right to the use of sufficient water from said pond to carry a fulling-mill, and three breast-wheels, each 12 feet in diameter, and 15 in length, with the machinery and works that may be attached or connected with the same." Then How agrees for himself, his heirs and assigns, "that he or they will not draw or use any of the water from the aforesaid mill-pond when there is not sufficient headwater in said pond to carry a fulling-mill and three breastwheels as aforesaid, or in any way deprive the said Hurd of the first and exclusive right to the use of the water in said mill-pond as hereinbefore reserved." Now, taking these deeds, it seems that at first Hurd owned all the land on both sides of the river. There was a saw-mill on the east side, and he sells all the land there was on the east side, with all the privileges thereunto belonging; except the privilege of the saw-mill, and he reserves a right to use all the water of the river on the west side. After he had done that, he conveyed to this Mr. How a right to erect just as many mills as he pleased on the east side, and to use the water for those mills, subject to only one limitation, and that was the three breast-wheels and a fulling-mill.

Mr. Child. He did not undertake to convey to him the water above that, but the right to use from the pond, reserving the exclusive right to himself of three breast-wheels and a fulling-mill. They both, I think, had the same privilege

of using the water.

Mr. Shattuck. That saw-mill is not mentioned in any deed here. Here are deeds by the hundred. The Middlesex right has been described, I will venture to sav, in a hundred deeds, and there has never been a suggestion of that old saw-mill which I can find anywhere. The only suggestion here comes upon an interpretation of that deed which it is

difficult to see how the ingenuity of any counsel could have

suggested.

Mr. Child. The fact still remains, that there is another privilege which has been used all the time, and that is the one which the commissioners saw when they were at Lowell, on the island.

Mr. Shattuck. We do not own all the water. There

are several parties owning portions of the water.

Mr. Child. I know there are several others. There is John Nesmith. I doubt whether the outstanding four twenty-fifths are not all of them in the Middlesex woollen mill. The commissioners saw the pen-stocks that run by

Mr. Stott's mill when they were up there.

Mr. Shattuck. I am so well satisfied with the construction of this deed, and with the subsequent deeds, that I should, of course, be glad to have any investigation made, and I would like to have the commissioners look at anything they can find. I have no doubt, if there was any saw-mill, they would have heard so; there would have been some little better evidence of it than Gen. Butler's argument.

Mr. Child. I do not know as we have got to find the

evidence.

Mr. Shattuck. I am willing to leave that without any further discussion.

Now, I come to the other point, — Abner Ball. The point is this: By the deed printed on page 931, Alpheus Smith conveys to Seth Ames and George Brown, in trust for creditors, a certain parcel of land, "except so much thereof as I have heretofore conveyed to Hazen Elliot and Abner Ball." Now, the objection is, that there is no conveyance to Abner Ball; and when Seth Ames conveys to the Whitney mills, he conveys the same lots (this was February 27, 1839), except so much as was conveyed to Hazen Elliot, making no reference to any conveyance to Ball (this is on page 932, "Deed from Seth Ames to the Whitney Mills), with a warranty against all persons claiming under Smith. Now, we have been in possession, and claiming title under this last deed of Seth Ames, for almost forty years, and that gives us a title. The land having been conveyed to Ames, subject to the conveyance to Hazen Elliot and Abner Ball, and Ames selling it and warranting it, subject to the Elliot deed only; and, there being no deed to Abner Ball anywhere to be found, the fair inference is that there was a mistake in the reference to a deed to Ball.

The conveyance to Ames was in trust for creditors, and may have been hastily made, or it may have been supposed there was a deed, or a contract for a conveyance, or some-



Commonwealth of Wassachusetts.

SUPERIOR COURT.

MIDDLESEX, SS.

DECEMBER TERM, 1876.

ESSEX COMPANY, PETR., vs. CITY OF BOSTON. SAXONVILLE MILLS, PETRS., vs. SAME. CHARLES P. TALBOT & AL., PETRS., vs. SAME. JAMES R. FAULKNER & AL., PETRS., vs. SAME. MARSHAL P. WILDER & AL., PETRS., vs. SAME. LUTHER W. FAULKNER, PETR., vs. SAME. C. BROWN SNYDER & AL., PETRS., vs. SAME. BELVIDERE WOOLLEN MFG. CO., PETRS., vs. SAME. SAMUEL N. WOOD, PETR., vs. SAME. LOWELL BLEACHERY, PETR., vs. SAME. NANCY L. RICHMOND, PETR., vs. SAME.

COMMISSIONERS' REPORT ON QUESTIONS OF LAW.

In the above-entitled causes, having been appointed, under the provisions of Chapter 177 of the Acts of 1872, to assess the damages, if any, which the several petitioners have sustained, and having made a report and award of damages in each of said causes, and having returned the same into said Court, we hereby, at request of counsel, make this further report of the rulings and decisions made by us upon certain questions of law presented at the hearing of said causes, and of the facts before us, so far as is necessary for the correct understanding of said questions, rulings and decisions; which further report we hereby make part of our said report and award of damages in each case, so far as the same is applicable thereto.

The several petitioners sought to recover damages for the taking and diversion from their several premises of the waters of the Sudbury river by the City of Boston, under the provisions of Chapter 177 of the Acts of 1872, and Chapter

167 of the Acts of 1846.

The premises of the Saxonville Mills are upon the Sudbury river. The premises of the Essex Company are on the Merrimack river, at Lawrence, below the point where the Concord river empties into the Merrimack; the premises of all the other petitioners are upon the Concord river, or derive their water-power from said river. The Sudbury river is a branch of the Concord.

It appeared in evidence, and was not in controversy before us, that under due authority from the City Council of the City of Boston, said city, by the Cochituate Water Board, in pursuance of the acts referred to, on the 21st day of January, 1875, took for the use and benefit of said city all the water of Sudbury river at and above a certain dam built by said city in 1872 in the town of Framingham, above the premises of said Saxonville Mills upon said river, and above the point where it empties into the Concord river, and on the 17th day of March, 1875, filed in the Registry of Deeds for the county of Middlesex a record or certificate of such taking, as required under the provisions of said Act of 1846.

A copy of said certificate is set forth on pages 17 and 18 of the printed record of the proceedings before us, and is hereby made part of this report, as also is said printed

record, so far as the same is hereinafter referred to.

It also appeared that prior to the filing of any of the petitions, to wit, from the 1st day of January, 1875, to the 18th day of March, 1875, as well as at sundry other times since the date last named, the City of Boston by its said dam diverted the whole water of the Sudbury river, including the flow of water from Farm pond, which is tributary to the Sudbury, excepting the flow of 1,500,000 gallons per day, reserved by Section 4 of said Act of 1872, and that the water so diverted was taken by an open ditch or conduit, previously constructed by said city, into Lake Cochituate,

for the use of said city.

The several petitioners claimed and proved title each to the several parcels of land described in their several petitions, copies of which are set forth in the said printed record, and are hereby referred to; and each of the petitioners except the Essex Company occupied its said lands, wholly or in part, as a mill-site for one or more buildings for manufacturing purposes, and with machinery dependent wholly or in part upon water-power derived from the several dams hereinafter more particularly specified; and it was for injury sustained by the diversion of water from the said premises by the said taking of the Sudbury river that the petitioners sought to recover damages.

Τ.

It appeared at the hearing that long prior to the taking of Sudbury river by the city, sundry dams had been built by riparian proprietors at various points upon the said river and its tributary branches above the works of the said city; and that the water-power derived from such dams was and long had been in use for manufacturing and mechanical purposes; that the reservoirs created by such dams, and the use thereof in the manner in which they were used and in which such reservoirs are ordinarily used and managed for such purposes, and for the prudent and economical use of the water of such streams, tended to equalize, and, in dry seasons and low stages of the water, to increase, the flow of a variable stream like the Sudbury river, and that the flow of the Sudbury was in fact so equalized and increased.

It did not appear that any of the petitioners had the legal right to compel the maintenance or to control the use of any of said dams or reservoirs, or any rights as to the same other than the ordinary rights of the lower riparian proprietor

against the riparian proprietor above.

It was contended by the city as applicable to all the cases before us, that the several petitioners could in no event claim damages except for the loss of the flow of the Sudbury river in a state of nature, unaffected by the construction and use of such dams and reservoirs; and that no damages should be allowed by us for the loss of such increased supply of water as was contributed by reason of such dams and reservoirs.

But being of opinion that the condition of things and the interest of the riparian proprietors, which led to the construction and long-continued maintenance and use of said dams and reservoirs, will substantially exist and continue in time to come, and that but for the diversion of the water by the city the riparian proprietors below, occupying and using the millsites of the several petitioners, might reasonably have relied upon such continued maintenance and use, and the beneficial effect thereof to their several premises; and that the marketvalue of their said premises and of their water-power thereat was properly increased by such expectation and reliance, — we have, in our several awards of damages to the petitioners, assumed that the flow of the Sudbury river would, but for such diversion, have continued to be, as it was before such diversion, beneficially affected by said dams and reservoirs, and that the petitioners are entitled to damages for its loss as so increased and benefited; but in such estimate and assessment of damages we make no allowance for any increased flow of the Sudbury river which can be attributed to the effect of a certain reservoir constructed by the City of Boston upon said stream.

II.

All the several petitioners contended that the acts of the city constituted a taking of the entire water of the Sudbury river above its dam, except of the reserved flow of 1,500,000 gallons per day; and that they were accordingly entitled to have their damages assessed upon the assumption that, with that exception, they would, from the date of the taking, be forever deprived, at all times and seasons, of the entire flow of said river.

On the other hand, it was contended by the city that it would not for many years require, at all times for its use, the whole flow of the Sudbury river, which it might by law divert; and that it did not intend to divert the whole flow thereof; and that the works which it was now constructing, and which it proposed to construct, would not be capable of so diverting the whole stream during a great part of the year; and evidence was offered on behalf of the city to establish

these propositions.

We were of opinion, and so held, that under said acts the city had acquired the right (with the exception above stated) to divert and take the whole water of the Sudbury river, and by its action under the same had asserted and exercised said right; that thereby the several petitioners had been divested of their right to have any part of the Sudbury river (except as aforesaid) flow to or by their several premises; and were entitled to recover the damages sustained in their several estates by the loss of such right; and that the city could not be heard nor allowed to introduce evidence as to its intent not to exercise its right to the fullest extent to which it was practicable for it to exercise the same; and we accordingly excluded said evidence, and have in our report assessed damages in favor of the several petitioners, upon the assumption that the City of Boston may, and will hereafter, divert all the water of the said river, at all times and seasons of the year during which it will be practicable so to divert it, except said 1,500,000 gallons per day.

It appeared in evidence that the flow of the Sudbury and the flow of the Concord and the Merrimack at the premises of the several petitioners vary within very wide limits at different seasons of the year; and that the magnitude and character of the works which are constructed, and which would be constructed by any prudent mill-owners upon said premises, to be operated by water-power, and the value of such water-power at said premises, are, and must be in a great degree, regulated and limited by and according to the supply of water which can be permanently and constantly relied on at low stages of the water in said streams. We find that at the

premises of the several petitioners, other than the Saxonville Mills, the supply of water furnished by the Concord and Merrimack rivers, from sources other than the Sudbury river, is and will be sufficient to supply, for a considerable period of each year, all the water which can be made practically available and of value to the several works of the petitioners, or to any other works which can prudently or reasonably be built upon the dams and mill-sites of said petitioners.

But we find as to all said petitioners other than the Saxon-ville Mills, that during such periods of the year as the Concord and Merrimack do not and will not furnish such sufficient supply from other sources than the Sudbury, and when, but for the diversion by the city, said petitioners could and would rely upon the contribution of the Sudbury for such supply, it will be practicable for the city to divert the entire flow of the Sudbury river above its dam; and that at some such seasons the said flow has been already so diverted; and that the works now constructed and in process of construction by the city, as shown and explained to us at the view of the premises, will be sufficient for such entire diversion at all such seasons.

And we have accordingly assessed the damages of said several petitioners, other than the said Saxonville Mills, on the assumption that at such seasons and at all seasons when the loss of the water of the Sudbury river will be appreciably and injuriously felt by the said petitioners, the flow of the Sudbury will be wholly diverted from their premises, except said reserved amount of 1,500,000 gallons per day.

III.

The case of the Saxonville Mills differed from that of the other petitioners in that they depended wholly upon the water of the Sudbury river for their supply of water-power; and they claimed, as the other petitioners did, that their damages were to be assessed on the assumption that from the time of the taking at all times and seasons they were to be wholly deprived of said entire supply.

We find, however, that in the nature of things, from the character of the stream of the Sudbury river, it will, in fact, be impracticable for the City of Boston to divert for its use the whole flow of the said river at all seasons of the year.

That under section 4 of the Act of 1872 the city is not authorized "to draw from Farm pond or Sudbury river into Lake Cochituate when the water runs over the dam at Lake Cochituate;" that the city has as yet exercised its right to draw said water from the Sudbury river solely through a

conduit or trench leading into said lake; and that there have been, and in the ordinary course of nature must and will inevitably be, times when the water will run over the dam at Lake Cochituate before the city can construct its new conduit or other works capable of receiving and diverting the whole flow of the river; and that there will also be in all future years some portion of time when a supply of water, however irregular in interval or variable in its amount, will reach said mills from the flow of the Sudbury past the works of the city, by reason of its being impracticable for the city wholly to divert the same; and in assessing the damages to which we find the Saxonville Mills entitled, we have, against the objection of the said petitioners, made an allowance for the slight value of the water already received by them, and which, upon our finding of the facts, they must and will hereafter receive from the surplus flow of the Sudbury.

IV.

The said Saxonville Mills also made claim for damages sustained in respect to a certain parcel of land at the outlet of Farm pond, being the parcel numbered 5, in the schedule annexed to their petition, and in respect to the dam and certain rights of flowage connected therewith. The title of the petitioners to the land and dam in question was disputed by the city; and no evidence was before us of any title in the petitioners, or that the right of flowage, if any such existed, was of any value whatever. And, accordingly, we find that the petitioners are not entitled to damages in respect to said land, dam, or rights of flowage.

It was agreed by the parties at the hearing that the Saxon-ville Mills might recover in this action such damages as they had sustained by reason of the diversion of the water of the Sudbury river at sundry times by the Water Commissioners, prior to the taking filed in January, 1875; and we have accordingly included such damages in our award in this cause.

v.

In answer to all the petitions except that of the Saxonville Mills, the respondents denied the right of the petitioners to recover any damages whatsoever, by reason of the defence set up in their answers to the several petitions, setting forth certain legislation concerning the Proprietors of the Middlesex Canal, and the action of said corporation under the same.

The respondents put in proof the charter of said corporation, Act June 22, 1793, Chap. 21, and the following acts in addition thereto, viz.: Act Feb. 28, 1795; Act June 25,

1798; Act January 26, 1800; Act March 3, 1803.

It appeared that it was found impracticable by said corporation to construct its canal as it was originally intended under its charter, and to use therefor the waters of the Merrimack, because at the point where the line of said intended canal intersected the Concord river, at Billerica, the waters of the Concord were twenty feet or more above the level of the waters of the Merrimack, where the same were to enter such canal.

That in 1794 the said corporation, by deed dated March 25, 1794 (a copy whereof is set forth on pages 372 and 373 of the printed record), purchased of Thomas Richardson, a parcel of land containing about 40 acres on the west side of Concord river, at Billerica, and a small parcel of land on the east side of said river, with the dam and mill privilege there known as Richardson's mills, being the same premises now held by Charles P. Talbot and Thomas Talbot, and by James R. Faulkner and Charles Faulkner, petitioners.

That said Richardson derived his title from one Osgood, whose title was obtained under a grant from the town of Billerica in 1708, set forth on page 371 of the printed record.

That said proprietors of the Middlesex Canal, in or about 1798, rebuilt the dam at said point in Concord river, and raised thereby a head of water to supply their canal, using the surplus water to operate their mills at said dam, and at all times reserving the first right of water for the grist-mill which had been built and maintained under the provisions of the grant to Osgood.

That in or about 1804 said proprietors completed their canal, carrying thereby the water of the Concord river into the Merrimack above Lowell, and into the Charles river near Boston, and opened and used the same for public navigation, using the head of water raised by their dam at Billerica to

feed their canal.

That in 1826 they built a new and more permanent dam at the same point, being the same now used by said Messrs. Talbot and Faulkner; and that they also rebuilt the grist-mill and other mills at said dam, and also at sundry times made grants of the water-power created by said dam, reserving, however, always the first right of water for said grist-mill, and also the right to use the water for their canal.

The title under these grants from said corporation became vested in the Messrs. Talbot and Faulkner, petitioners, prior to their deeds of partition made in 1857, and hereinafter referred to.

It appeared that during part of the dry seasons of the year the canal required nearly all the water of the Concord river beyond what was required for the use of said gristmill.

That said canal was maintained and used by said proprietors until 1851, when it became and was wholly unfit for use, and was in part filled up, and was wholly abandoned; and that it has been ever since entirely disused and abandoned.

That at or about the time of so abandoning the use of said canal, and as part of the winding up of its affairs, said corporation, by deed dated September 22, 1851, set forth on pages 363 to 369 of the printed record, conveyed to said Charles P. Talbot and Thomas Talbot all its lands at said Billerica, and all its rights, title, interest, and estate, under said deed of Thomas Richardson, in and to the use of the waters of Concord river, and the mill privileges thereto belonging, subject to the said prior grants, and to the conditions set forth in said deed.

By said deed the said corporation expressly reserved over the lands conveyed, which included portions of its canal, all easements and services necessary for or incident to the preservation and use of said canal, for the purposes of navigation, and of all rights of the public therein, until the

same shall be lawfully discontinued.

Said deed also contained the "express condition that the said grantees shall perform all the duties and obligations towards the town of Billerica which the said grantors are bound to perform by virtue of the vote of the inhabitants of said town, referred to in the deed of said Thomas Richardson, and all other conditions set forth in said deed; and also, that the said grantees shall not, whensoever forbidden so to do by said corporation, in writing, signed by their agent, and until said canal shall be lawfully discontinued, draw the waters of said river lower than three-fourths of an inch below the top of the flash-boards on the stone dam (the lawful height of said flashboards being fixed by the top of an iron pin driven into a fast rock at the side of the river, near said dam, which is referred to, to determine the point below which the said waters shall not be drawn); and on the further condition that the said grantees shall, after the discontinuance of said canal, either maintain and keep in good repair at their own expense, the two canal bridges southerly of the Concord river, adjoining lands above described, or else shall take down the said bridges and fill up said canal under the same, and make thereon in

the place of said bridges a good, sufficient roadway to the satisfaction of the town of Billerica; the said grantees to have for their own use and benefit all the stone and materials

of which said bridges are composed."

It also appeared that since 1851, at all times, the said Messrs. Talbot and Faulkner have been seized and possessed and in open and exclusive enjoyment, adversely to all other persons, of the land and mills formerly of the said corporation at said Billerica, and of certain mills by them, the said Talbots and Faulkner, built at said dam, and of the said dam, and the water-power and use of the water of the Concord river thereat, for the purpose of running their said mills,

as set forth in their several petitions.

That in 1857, by deed from said Faulkners to said Talbots dated April 1, 1857, and by deed from said Talbots to said Faulkners, dated May 8, 1857, which deeds are set forth on pages 376-381 of said printed record, said Faulkners conveved to said Talbots all the lands, mills, water-rights and mill-privileges by them acquired, owned, or held as aforesaid, and said Talbots reconveyed to the said Faulkners the land and mills now held by said Faulkners, as set forth in the petition, with the right to said Faulkners to draw and use water from the Concord river for said mills, and reserving to the said Talbots the right to draw and use water from said river for their mills, as defined and limited specifically by the grants, conditions and reservations in said deed minutely set forth.

The town of Billerica, by deed dated March 25, 1864, set forth on page 370 of the printed record, released and conveyed to said Talbots "all the right, title and interest which said town of Billerica has in and to the real estate privileges, easements, provisions, and conditions specified in a vote of said town, passed at a general town meeting, held October 4th, 1708, granting certain lands and rights to Christopher Osgood, Jr., of Andover, as appears by the record of the town; hereby also releasing said C. P. Talbot and Thomas Talbot, their heirs and assigns, from all obligations to maintain a grist-mill, as is provided in said last-named vote of said town."

The respondents also put into the case the Act of 1860, Chapter 203, entitled "An Act in relation to the Proprietors of the Middlesex Canal," approved April 4, 1860; and the petitioners put into the case the "Resolve concerning the Middlesex Canal," approved March 29, 1859, Chap. 38, Acts and Resolves 1859; also a certified copy of the decree of the Supreme Judicial Court of Middlesex County, passed at the April term, 1859, set forth in pages 126-128 of said printed record.

The respondents contended that under the charter of the Proprietors of the Middlesex Canal and the acts in addition thereto above cited, and by virtue of the proceedings of said corporation under the same, and the facts above found, all the water of the Concord river, including all the water of the Sudbury, was taken, held and appropriated forever for a public use; that, inasmuch as the statute under which the same was so taken, provided compensation in damages for all persons injured thereby, it must be conclusively presumed that such damages had been paid, including the damages sustained by reason of such taking by the predecessors in title of all the petitioners, except the Saxonville Mills; that under the Act of April 4, 1860, Chap. 203, all the rights, privileges and franchises of said corporation, including the right by it acquired to the whole water of the Concord river, became vested in the Commonwealth of Massachusetts; that the prior grants of said corporation to said Talbots and Faulkners and their predecessors in title were ultra vires, and conveyed no title to the grantees so far as the same conveyed, or purported to convey, any rights to the water of the Concord river; and that therefore the said several petitioners are not entitled to recover any damages by reason of the diversion of the water of the Sudbury river by the City of Boston, under the Act of April 8, 1872, Chap. 177, the same being for a public use.

But being of opinion that the said charter and acts in addition thereto, and the proceedings of said corporation under the same, and the decree of the Supreme Judicial Court above cited, and the Act of April 4, 1860, annulling and declaring forfeit the charter and franchises of said corporation, upon the facts above found, in no manner affected or impaired the title of the several petitioners to their several estates, as set forth in their petitions, or their right at the time of the said taking to the flow of the whole water of the Concord river, including the Sudbury, by their said premises, and to the use thereof according to their several claims, as set forth in their petitions, or their claim to recover damages under Section 5 of said Act of 1872, and especially that said Charles P. Talbot and Thomas Talbot, and said James R. Faulkner and Charles Faulkner had maintained their title to the lands and waterrights set forth in their petitions, we have assessed damages for said several petitioners, as set forth in our award, notwithstanding the said objections of the respondents.

VI.

The Essex Company put in evidence its charter, Act 1845, Chap. 163, and the amendments thereof, Act 1846, Chap. 119, Act 1848, Chap. 295. It appeared that under its charter it at once acquired by purchase large tracts of land upwards of a mile in length lying on each side of the Merrimack river, comprising in all 1,800 or 2,000 acres; and that prior to 1848 it built a dam from its land on the north side of said river to the south side thereof, and constructed a canal on the north side of the river for the purpose of creating a water-power, and of conducting the same to its lands on said north side, to be occupied as mill-sites for the use of said power; and that it subsequently, in 1867, constructed a canal for the like purpose on the south side of the river; that both said canals were wholly within the lands owned by said corporation; that the cost of these structures was about \$650,000; and that said corporation has also under Act 1846, Chap. 119, expended about \$200,000; in improving its water-power by constructing or improving storage-basins on said river at or about Lake Winnipiseogee.

That ever since the time of their construction said corporation has maintained and used said dam and canals, and the structures connected therewith and needful for the use thereof, and has, by itself and its grantees, as hereinafter stated, exclusively and adversely to all persons, enjoyed the use of the entire water-power of said river created by

said dam.

That from time to time, from 1846 to the present date, it has sold and leased to various corporations and persons lands upon or near its said canals, to be used by them for mill-sites, houses for operatives, and other purposes connected with manufacturing establishments, and has granted to the purchasers and lessees of such lands rights to use for water-power certain quantities of water, to be drawn by them through its said canals, under certain restrictions and for certain considerations paid and to be paid.

That the available water-power to be derived from said river by means of the dam and structures of said Essex Company is in all about 186 mill-powers, so called; and that only about 122 mill-powers have been so disposed of by grant or lease; and that the purchasers and lessees under said corporation are and will be in no way affected as to the amount of power which they are entitled to have, and will be able to have and use, by any diversion of water by the

City of Boston.

That said corporation has also sold large quantities of its land for general building purposes, and uses not directly

connected with the use of water-power, the city of Lawrence being built in great part upon the land so sold; and that it still owns considerable tracts of land on both sides of said river; that on the north side being valued at about \$200,000, and that on the south side, of about 600 acres, being valued

at about \$1,000,000,

That part of its lands so remaining unsold is available for mill-sites and for uses connected therewith, and with manufacturing establishments which may be built thereon; and that a sufficient portion thereof is so available upon said canals, and the intended extension thereof, to furnish room for manufactories which would require and exhaust the whole available water-power of said river at said dam, leaving large tracts of land belonging to the said corporation adapted for general building purposes, and uses not directly connected with water-power, and which are now held by said corporation for sale for such general purposes and use.

The petitioner claimed that, by the diversion of the Sudbury river by the act of the City of Boston, the amount of water-power derived by it from said river, by means of said dam and canal, and available for sale and use, was diminished, and that thereby its entire property and estate, including all its tracts of land held by it for sale as above stated, were injured by the depreciation of their market value; and claimed to recover damages for such injury in respect to its entire

property.

We find that by the said diversion of Sudbury river the water-power of said Essex Company is and will be appreciably diminished; and in our award made on the petition of said corporation we have awarded damages therefor, and in such award we have included all damages sustained by the petitioner in respect to its water and water-rights, and waterpower, and its dam, canals and other structures connected therewith or pertaining thereto, and in respect to any and all its lands and real estate connected with said water and water-power, and structures, and capable of use or available for sale in connection therewith, including all lands available for sale or use for mill-sites or operatives' houses, or for manufacturing and mechanical purposes in connection with such mill-sites or water-power. But we have not awarded damages to said corporation in respect to its other lands held for sale as aforesaid and not connected with its water-power or structures, nor available for sale or use for mill-sites, or in connection with manufacturing or mechanical establishments using such water-power, for any injury sustained in such lands by any diminution of their market value on account of the general effect upon real estate at

Lawrence, produced by the diversion of the Sudbury river and the consequent diminution of the water-power of the Merrimack at Lawrence; because we deemed such damages to be too remote and speculative, and because the same are sustained in common with all other parties owning real estate in said Lawrence, situated in like manner, including all or nearly all the real estate in said city.

VII.

The respondents contended that the Essex Company was not entitled to recover damages for any diminution of its water-power by the diversion of the Sudbury river, because the Merrimack river is a navigable stream, and because, as they contended, the riparian proprietors upon such stream are not entitled to damages for the diversion of any part of the water thereof for a public use. But being of opinion that under its charter the said corporation was entitled to create, by a dam upon said river, a water-power for its own use, and to sell and lease said power, and that upon the construction of said dam said water-power became the property of the said corporation, and that the said corporation has sustained injury in its said property as well as in its lands, as hereinbefore set forth, by the diversion of the Sudbury river by the respondents, we found that it was entitled to damages under the provisions of Section 5 of the said Act of 1872, and assessed the same according to our award upon its petition.

VIII.

Upon the petition of Marshall P. Wilder and al., Luther W. Faulkner, Samuel N. Wood, The Lowell Bleachery, C. B. Snyder and al., and The Belvidere Woollen Company, the petitioners severally showed title as claimed in their petitions, under grants from Oliver M. Whipple, to the several parcels of land therein described, and to the mills standing upon said land, and there was no controversy as to their several titles.

The premises of these petitioners are near the Concord river, in Lowell, and upon or near a canal built by said Whipple, by which the water of the said river, raised by a dam, also built by said Whipple across said river, is conducted to the premises of the petitioners and used for waterpower. Said dam and canal were built by said Whipple more than forty years ago, and have been ever since maintained by him and his successors in title. Said dam is now known as the Wamesit dam.

The deeds under which the several petitioners claim are set forth in said printed record as follows:—

Marshall P. Wilder et al. at	pages		546 - 563
Luther W. Faulkner	- 66		573 - 579
Samuel N. Wood	66		580 — 583
The Lowell Bleachery	6.6		590 - 592
C. B. Snyder and al.	66 .		603 - 610
Belvidere Woollen Company	6 6		884 — 887

Under their grants from said Whipple the petitioners were severally entitled to draw from said canal for use upon their premises a certain specified number of cubic feet of water per second for eleven and one-quarter hours per day for six days in each week, whenever the quantity of water flowing in the canal should equal 288 eubic feet per second, for said time; and whenever the quantity of water in said canal should fall below 288 eubic feet per second, the parties were restricted each to a certain aliquot part of the water actually flowing there, represented by a fraction, of which the said specified number of feet was the numerator and 288 was the denominator. Said deeds also conveyed to the several petitioners the right to have the water of Concord river enter said canal to the extent therein specified, and the right to have said canal and dam maintained for the purpose of supplying them with water-power, and also contained covenants on the part of said Whipple for the maintenance of said permanent dam and of flash-boards thereon, and for the enlargement and maintenance of said eanal to a sufficient capacity to earry 288 feet of water per second, whenever the water in the river and canal is as high as the top of his said permanent dam.

It appeared that by such grants said Whipple and his successors in title, including the Wamesit Power Company, had conveyed, prior to January 1, 1875, to the petitioners and to other parties, in all, the right to use, for the number of hours in each week above stated, 220 feet per second, out of the water in said canal whenever the amount of water flowing therein is 288 feet per second; and at all other times the right to use $\frac{220}{350}$ of the amount of water actually flowing therein during the like number of hours; and that by deed from one Patch to Benjamin F. Butler, dated February 15, 1865, and by deed from said Butler to the Wamesit Power Company, dated February 10, 1866, all the remaining right to the said Whipple's dam, and eanal, and to the water of Concord river and the water-power derived therefrom, which formerly belonged to said Whipple, became vested in said Wamesit Power Company, subject to said grants and to the

obligations and covenants contained in said grants by and under said Whipple. Said deeds from said Patch and said Butler are set forth in said printed record at pages 959–962.

The respondents, at the hearing of the said petitioners claiming rights upon the Wamesit dam, produced and offered in evidence, a deed dated December 1, 1875, from the Wamesit Power Company to the City of Boston, the material part whereof is set forth in pages 841, 842 of the printed record, as follows:—

"Said Wamesit Power Company, in consideration of fifty-five thousand dollars, and other sufficient considerations, the receipt whereof is hereby acknowledged, said company thereunto moving, does hereby release the City of Boston of, and from, every and all damages, compensation and claim of damages, of whatsoever name or nature, arising out of, or because of, the taking of the water of Sudbury river, a branch of the Concord river, under and by virtue of the provisions of said act, or however otherwise taken by said city

up to the date hereof.

"And in addition said Wamesit Power Company, for the consideration aforesaid, does convey, transfer and set over to said City of Boston, the amount of water which may flow in their said canal equal to the aliquot part of sixty-six (66) cubic feet of water per second whenever the water is below the level of the permanent stone dam of said company, said aliquot part being that which will flow in and through said canal when the water is below the top of said permanent stone dam, being sixty-six two hundred and eighty-eighth parts $\binom{66}{288}$ of said water then and there flowing, to be drawn by the City of Boston or their assigns, as each may choose to do, through any of the penstocks or flumes of any of the proprietors of water who have now a right to draw the same from said canal, other than said Wamesit Power Company, through which said city or its assigns may elect to have said water drawn, whether through one or more of said flumes or pen-This right to draw water by said city, or its assigns, to be exercised only for eleven and one-fourth $(11\frac{1}{4})$ hours per day for six (6) days in each week forever, but not more or otherwise."

The respondents' counsel stated that said deed was offered for the purpose of showing that at the time of filing the several petitions, or some of them, the city was joint owner or owner in common with the petitioners of the said Wamesit dam, or the water-power or the water-rights thereat.

But as we deemed said fact immaterial, and as it further

appeared that all the petitions were filed long before the date of said deed, we ruled that it was inadmissible in evidence

for the purpose stated.

The counsel for the respondents thereupon made a renewed offer of said deed in evidence, accompanying it with an offer to put on file in these several causes a conveyance from the City of Boston to each of the petitioners of certain portions of the water-power upon the Wamesit dam, which should equal the entire amount of water furnished them by the Sudbury river at said dam; and thereupon offered said deed from the Wamesit Power Company to the city as admissible in mitigation of damages. But no such deeds from the City of Boston to the several petitioners were produced or offered, nor was it claimed that any such deeds were in existence, and we therefore refused to admit in evidence said deed from the Wamesit Power Company to the city.

At a later stage of the hearing said deed from the Wamesit Power Company to the City of Boston was again offered in evidence, upon the ground that under said deed the said city had become entitled at the Wamesit dam to a larger amount of the water of the Concord river than that which it took by the diversion of the Sudbury, and that it was therefore enti-

tled to take the same at the point of such diversion.

But being of opinion that such claim could not be sustained, and that the said deed was not admissible for that purpose, we excluded the same, against the objection of the respondents.

IX.

The respondents contended that all the petitioners, having interests in the water-power derived from one and the same dam, and claiming damages for the loss or diminution of such power, must join in their proceedings to recover such damages; and that on the facts and titles above stated, the several petitions of Charles P. Talbot and Thomas Talbot, and of James R. Faulkner and Charles Faulkner, could not be sustained, because all said petitioners should have joined in one petition, and that the several petitions of Marshal P. Wilder et al., and of Luther W. Faulkner, and of C. Brown Snyder et al., and of Samuel N. Wood, and of the Lowell Bleachery, and of the Belvidere Woollen Manufacturing Company, could not be sustained, because all said petitioners should have joined with each other and with other parties having interests in the water-power on the Wamesit dam in one petition.

It appeared that the petitioners in each cause before us

were, at the time of the taking by the city, severally seized of the parcels of real estate described in their several petitions, with the mills thereon and the machinery therein dependent for their power upon the water furnished by the Concord river, and dependent upon said power for their use and value, and that their claims for damages were for the injury sustained in respect to their several estates by the diminution of the supply of water for the operation of such mills and machinery, and for use in connection with and as appurtenant to their said estates.

And being of opinion that no rule of law requires the joinder of said parties in one petition, as claimed by the respondents, but that they are entitled to maintain their several petitions, we have overruled the objection of the respondents and have assessed damages upon said several petitions.

X.

Upon the petition of the Belvidere Woollen Manufacturing Company, the petitioners showed an uncontroverted title by grant to the land and mill described in their petition situated upon or near the Middlesex dam, so called, in Lowell, upon the Concord river, and that they were in possession and enjoyment of the same and of a portion of the water and waterpower of said river at said dam. The nature and extent of their right to said water was in dispute.

It was admitted by the petitioners that the Middlesex Company was entitled to a prior right to the use of the water of the Concord river at said dam, the extent of which prior right was in question; and they also admitted that other parties were entitled with them to the use of said water, subject

to said right of the Middlesex Company.

The rights of all parties were derived under a deed from Thomas Hurd to Winthrop Howe, dated May 31, 1821, and an indenture of the same date between said parties, which deed and indenture are set forth on pages 915–917 of said

printed record.

The respondents contended that by said indenture the said Hurd reserved to himself the saw-mill privilege mentioned in said deed, as well as "the first and exclusive right to the use of sufficient water to carry a fulling-mill and three breast-wheels;" and that the title to said saw-mill privilege had never vested in the petitioners, but was vested in the Middlesex Company, or outstanding in other parties than the petitioners; and that the rights of the petitioners in the water at said dam were subject to the prior rights of the owners of said privilege, as well as to the prior rights of the

Middlesex Company to the water required for a fulling-mill and three breast-wheels.

But we were of opinion, and so ruled, that upon the true construction of said deed and indenture said saw-mill privilege was not reserved to said Hurd; and upon the whole evidence of title we found that the petitioners were entitled to the use of ninety-one one hundred and twentieth parts $(\frac{91}{120})$ of the water of the Concord river at said dam, subject to the prior and exclusive right of the Middlesex Company to the use of sufficient water at said dam to carry a fulling-mill and three breast-wheels; and assessed damages for the petitioners accordingly.





